NAVY CIVIL ENGINEER

SUMMER 1973

Kodiak, Alaska after earthquake and tidal wave in March 1964

ENGINEERING VS. NATURAL DISASTERS

See Page 4

DEPARTMENT OF THE NAVY
FACILITIES ENGINEERING COMMAND

NAVY CIVIL ENGINEER

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DISASTER MITIGATION PROGRAMS

By NATIONAL BUREAU OF STANDARDS / NATIONAL SCIENCE FOUNDATION

• Washington, D. C.

Seventy-one recommendations aimed at reducing death and destruction during natural disasters through better building practices have been developed by a national group of experts. The recommendations were developed at a workshop sponsored by the Commerce Department's National Bureau of Standards and the National Science Foundation.

Property losses in the United States due to natural disasters average more than $1 billion a year. An even larger part of the problem is the human suffering, disruption of production activities, and the effort and expenditure of disaster relief. These factors are difficult to quantify, but are among the major losses in any disaster.

The recommendations were released in a report entitled "Building Practices for Disaster Mitigation" by the NBS Center for Building Technology. The suggestions are directed at policy makers, standards writers and the building industry. Experts at the workshop included engineers, physical scientists, architects, planners, social scientists, economists, and public administrators from all over the country.

The recommendations call for improved building codes to assure public safety during nautral disasters, better planning, and additional research.

One recommendation urges re-structuring federal disaster assistance to provide incentives for minimizing disaster damage through improved practice and reducing present incentives for ignoring risks.

Another recommendation suggests that codes, standards and contracts should recognize the degree of risk inherent from nautral disasters and specify the degree of protection offered by the specific structure.

Earthquakes, extreme winds and other dynamic hazards are covered in the 475-page report. The study is part of a major cooperative effort aimed at closing the gap between building research and practice. The program involves federal agencies like NBS, NSF, and the Defense Civil Preparedness Agency, as well as professional organizations, the academic community, state and local governments.

As part of the National Bureau of Standards' continuing program, the Center for Building Technology has long been conducting on-the-scene investigations into the performance of buildings under a variety of conditions, including hurricanes, floods, tornados, and earthquakes.

The government's interest is significant because more than a third of all U.S. building construction is federally financed — directly or indirectly. Besides this investment, the government has statutory responsibilities like those set forth under the Federal Disaster Assistance Program. The magnitude of this commitment can be seen in the 1971 San Fernando earthquake where the government-funded nonrepayable reconstruction loans totalled nearly $200 million.

The new report is NBS Building Science Series No. 46, "Building Practices for Disaster Mitigation," now available through the Superintendent of Documents, Government Printing Office, Washington, D.C., 20401, for $5.30.

The Center for Building Technology is the organizational unit in the National Bureau of Standards most concerned with disaster related studies.

Disaster programs within CBT focus on (1) development and implementation of building practices aimed at mitigating losses from disasters and (2) development of post-disaster response capabilities for relief and recovery activities. They use technical expertise of all relevant professionals including engineers, architects, chemists, physicists, planners, economists, and psychologists.

Mitigation of Disaster Losses

Mitigation of the effects of natural disasters on structures with human occupancy includes a variety of problems, from a definition of the extreme environments encountered to the development and implementation of improved building practices. These building practices are an integral part of risk analysis and must be considered in evaluating vulnerability to natural disasters. Research on these problems is underway in the Center for Building Technology in structures, interior environments, durability of materials, fire safety standards and codes, architecture, building economics, and thermal and sensory engineering. This research provides knowledge for the development of engineering standards and the measurements related to them. Major emphasis is also given to implementation of improved building technology.

Technical consultation and advice are provided the federal agencies, state and local governments, and the building industry at large. Close cooperation is maintained with the organizations that draft, promulgate, and distribute building standards and codes including the National Conference of States on Building Codes and Standards (NCSBCS), a group which the states organized and which CBT serves as secretariat.

A recent major effort of the Center for Building Technology initiated on April 1, 1972 is the cooperative program with the National Science Foundation/Research Applied to National Needs Research Program on Disasters and Natural Hazards. This program, entitled Building Practices for Disaster Mitigation, is intended to close important gaps between research and building practices. Current practices in land-use planning, building codes, inspection of new and existing buildings, etc., do not, in general, reflect the increased knowledge of extreme loads and the ultimate resistance of buildings. The participating organizations have undertaken a program that will (a) synthesize current knowledge and develop improved building practices for assuring the safety of new and existing buildings with substantial human occupancy, and (b) make this knowledge available in usable form to assist state and local officials in effecting land-use planning and building regulations to mitigate the impact of natural disasters.

The program focuses on practices which give integrated consideration to natural disasters from earthquakes, hurricanes, tornados, and extreme winds, as well as explosions and accidents which produce similar effects. It is felt that the cost of this integrated program is little more than that of attacking earthquake hazards alone. The benefits are substantially increased since most buildings are subject to several of these hazards. Objectives of the program include greater life safety, protection of property, and maintenance of vital functions under disaster conditions.

The program is closely coordinated with approximately $25 million of related research on disasters and natural hazards to be conducted by the NSF/RANN program during its initial three year period. The National Bureau of Standards brings to the program its research expertise and

laboratory facilities in the many professional disciplines which contribute to building technology, and strong liaisons with the building community including professional engineers, planners, architects, building officials, representatives of state and local governments, model codes agencies, builders, labor organizations, university researchers and federal scientific research and construction agencies.

The first phase of the program culminated in a workshop providing a critical review of current building practices for disasters mitigation. The proceedings of the workshop have recently been published (February 1973) as Building Science Series 46, "Building Practices for Disaster Mitigation." It includes 15 review articles describing the state of the art of building practices and recommendations for policy makers, best practices for current applications, improvements of building standards, and research needs.

One project within the cooperative program supported by the Defense Civil Preparedness Agency is aimed at the development of a methodology for survey and evaluation of existing buildings to determine risks of damage under natural disaster conditions and to identify how buildings can be strengthened if risks are excessive. There is much unexploited research knowledge on the extreme loads of natural disasters and the response of structures to these extreme loads. This fragmented information needs to be collected and synthesized to define the risks of structural damage under disaster conditions. At present, there are no criteria or policies which have received broad professional consensus as to which levels of risk are acceptable. The project will provide: definition of data to be collected in surveys to define natural disaster risks of existing buildings, and procedures for evaluating building safety from the survey data. Criteria for defining "safe" buildings and those requiring strengthening or replacing will allow responsible authorities to define the safe level of risks in accord with local conditions including natural, economic, and social factors. The development of this methodology will be coordinated with the Defense Civil Preparedness Agency All Effects Shelter Survey program. Information for this study defining the loadings encountered by structures in natural disasters is being gathered from the Corps of Engineers, National Oceanic and Atmospheric Administration, U. S. Geological Survey and other federal agencies.

Efforts are also underway to update existing building code provisions related to earthquake resistant design. This activity involves modifications to design procedures and criteria reflecting the increased knowledge of building performance gained through recent earthquake experience and research. This will be the first stage in updating the most widely recognized seismic design standards in the United States.

A program, sponsored by the Agency for International Development, has also been initiated to identify technical improvements in the siting, design, and construction of housing in developing countries which promise to increase their resistance to earthquakes and storms and are consistent with the social and economic capabilities of the population. The research includes a critical examination of existing knowledge relative to design, siting, and construction as well as analyses of socio-economic considerations that have impeded progress in housing technology.

Work completed in August 1972 for the Small Business Administration included the development of techniques to determine the nature of earthquake induced damage in structures. Laboratory studies on the performance of building materials, components and systems subjected to earthquakes were conducted as part of this project.

Another project concerned with mitigating losses resulting from floods has been prepared. The development of improved standards and codes for buildings subjected to flooding is included. Information for use of homeowners before, during, and following the occurrence of flooding will also result from the study.

Field data on extreme wind loads have been gathered by NBS personnel at various locations throughout the country. Additional data on wind pressure distributions at points on the exterior surfaces of buildings is being obtained from instrumentation installed on the National Bureau of Standards' facilities in Gaithersburg. Instrumentation to measure the response of structures subjected to these loadings has been developed and is being field tested. These studies are aimed at mitigating the recurring extensive losses resulting from extreme winds including hurricanes and tornados.

Center personnel have been directly involved in preparing the new version of the American National Standards Institute Standard A 58.1, "Building Code Requirements for Minimum Design Loads in Buildings and Other Strucutres." This revised standard has been written in a form which permits assessment of the level of risk accepted in the design.

Post Disaster Response

Post-disaster response activities include technical assistance to agencies directly concerned with disaster relief as well as field investigations to assess the performance of buildings and other facilities in disasters.

The Center for Building Technology has been extensively involved in disaster investigations. These activities evolved from *ad hoc* investigation teams supplied in response to requests from Congress, the Defense Civil Preparedness Agency, the Office of Emergency Preparedness, and the State Department. Investigations as an example have included the Fairbanks, Alaska, flood in 1967; Hurricane Camille in 1969; the Lubbock tornado in 1970; the San Fernando earthquake in 1971; Hurricane Agnes in 1972; and the Managua, Nicaragua, earthquake in 1972.

These investigations are an integral part of CBT's overall mission responsibility for improving building performance. Objectives of the investigations include:

1. Provide technical advice and services relative to engineering problems in connection with relief, recovery, and rehabilitation activities.
2. Collect, compile, and analyze information on response of structures to natural disasters. Results including recommendations for improved practice and needed research are presented in written reports to the professional community and policy groups.

The investigations deal with the effects of the disaster on all aspects of building performance including the structural system, materials, and building service systems. Experience has shown that substantial benefits in mitigating the effects of natural disasters have accrued from these efforts.

Additional information on these programs may be obtained from:

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Significant Items

- Life loss (San Fernando Earthquake-59; Hurricane Agnes-181) and human suffering associated with natural disasters are difficult to quantify; property losses from U.S. natural disasters, however, have averaged approximately $1 billion per year in recent years.
- Federal concern with building practices for disaster mitigation arises from major statutory responsibilities. Approximately 37 percent of all new construction is directly or indirectly federally supported. State government responsibilities include their constitutional authority for the promulgation of building codes.
- Improved codes and standards can reduce the rate of disaster property losses in new buildings. Acceptable levels of risk of disaster loss depend upon a balance between the value of lesser risk and the costs of obtaining it.
- Thousands of hazardous buildings existing in Seismic Zone 3 present undue risks to their occupants. In addition to California, areas of South Carolina, Missouri, Massachusetts, and others are included in seismic risk areas.
- The Managua earthquake, which resulted in approximately 10,000 deaths, had a magnitude of 6.5 on the Richter Scale. Property damage was estimated on the order of $850 million.

Partial Listings of Reports on Disaster Investigations and Extreme Environments

1. BUILDING PRACTICES FOR DISASTER MITIGATION
   Wright, R., Kramer, S., Culver, C. (Editors), *Building Practices for Disaster Mitigation,* Building Science Series 46, February 1973, LC Catalog No. 73-600006, Price $5.30 domestic postpaid or $4.75 GPO Bookstore.
2. ENGINEERING ASPECTS OF THE 1971 SAN FERNANDO EARTHQUAKE
   Lew, H. S., Leyendecker, E. V., and Dikkers, R. D., *Engineering Aspects of the 1971 San Fernando Earthquake,* Building Science Series 40, December 1971, SD Catalog No. C 13.29/40, Price $3.00. (GPO)
3. LUBBOCK TORNADO: A SURVEY OF BUILDING DAMAGE IN AN URBAN AREA
   Somes, N. F., Dikker, R. D. and Boone, T. H., *Lubbock Tornado: A Survey of Building Damage in an Urban Area,* NBS Technical Note 558, March 1971, SD Catalog No. C 13.46:558, U.S. Government Printing Office, Price 50 cents.
4. HURRICANE CAMILLE — AUGUST 1969
   Dikkers, R. D., Marshall, R. D., and Thom, H. C. S., *Hurricane Camille — August 1969,* NBS Technical Note 569, March 1971, SD Catalog No. C 13.46:569, U.S. Government Printing Office, Price 70 cents.
5. PROCEEDINGS OF TECHNICAL MEETING CONCERNING WIND LOADS ON BUILDINGS AND STRUCTURES
   Marshall, R. D., and Thom, H. C. S. (Editors), *Proceedings of Technical Meeting Concerning Wind Loads on Buildings and Structures,* Held at the National Bureau of Standards, Gaithersburg, Maryland, January 27-28, 1969, Building Science Series 30, November 1970, SD Catalog No. C 13:29/2:30, Price $1.75. (GPO)
6. HAIL RESISTANCE OF ROOFING PRODUCTS
   Greenfeld, S. H., *Hail Resistance of Roofing Products,* Building Science Series 23, August 1969, SD Catalog No. C 13.29/2:23, Price 25 cents. (GPO)
7. WIND RESISTANCE OF ASPHALT SHINGLES
   Cullen, W. C., *Wind Resistance of Asphalt Shingles,* American Roofer and Building Improvement Contractor, December 1965, Vol. 55, No. 12 (6.1), price free. Building Research Division, Scientific and Professional Liaison Section.

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All publications, except Item No. 7, may be ordered from the "Superintendent of Documents, Government Printing Office, Washington, D. C. 20402."

NSF Conducting Research On Earthquake Engineering

By NATIONAL SCIENCE FOUNDATION

Earthquakes pose a serious threat to essentially the entire United States.

It is estimated that of some $3,000 billion to be expended on construction in the United States during the rest of this century, over $500 billion will be spent in highly seismic regions.

Practically speaking, earthquake engineering in the United States is only about 40 years old, dating from the 1933 Long Beach, (Calif.), earthquake. Information about strong earthquakes, their effects, and how to cope with those effects, is not yet complete.

The National Science Foundation (NSF) earth engineering research program seeks safe and economic seismic design criteria and methods of design for most important types of structures; guidelines for decreasing the earthquake disaster potential of highly developed urban areas; rational criteria for evaluating the earthquake hazards of existing structures; and techniques for evaluation of risk at particular sites.

Nine research areas address the problem:

- Socio-economic effects and costs.
- Ground motion measurements and risk assessments.
- Dynamic analysis of structures.
- Detailed fabrication of structures.
- Tsunamis (earthquake caused waves): observation and protection.
- Design and distributional aspects of public services and utilities.
- Technology transfer.

There are about 60 active projects in the NSF earthquake engineering research program. The typical research program involves funding at about $90,000 a year.

Earthquake engineering research is part of the disaster and natural hazards program, within NSF's program of Research Applied to National Needs (RANN). The program manager is Dr. Charles C. Thiel. Dr. Thiel was NSF's representative in the National Workshop on "Building

Practices for Disaster Mitigation" which underlies the accompanying report of that title.

The U.S. Geological Survey, Department of the Interior, is the Federal agency having the principal continuing complementary role to NSF's in earthquake research.

Within NSF, the other principal program supporting earthquake research is the geophysics program in the Research Directorate. Others include the engineering mechanics program in the Research Directorate; and in RANN, the environmental systems and resources division and the social systems and human resources division.

The NSF earthquake engineering research program has utilization of its results as a major objective. Actions toward that end include funding support for:

- National Information Service for Earthquake Engineering (NISEE), University of California, Berkeley-Caltech.
- Abstract Journal in Earthquake Engineering, published annually, under NSF grant, by the Earthquake Engineering Research Center, University of California at Berkeley.
- The University of California, Berkeley earthquake simulator developed under NSF support. This can excite structures up to 60 tons, and three stories high full scale, and is capable of reproducing the real ground motion characteristics of the most damaging earthquakes.
- Universities Council on Earthquake Engineering (UCEER), an organization of university researchers meeting regularly to discuss research and results.
- Joint Federal Program in Building Practices for Disaster Mitigation, currently funded together with National Bureau of Standards and Defense Civil Preparedness Agency.
- Coordination with other agencies to develop utilization of results of NSF sponsored research.

Economic and Social Aspects of Earthquake Problems

Special emphasis is being placed on the three important results of failure of a structure: loss of life, damage to property, and loss of function. An important aspect is micronization, the assignment of risk levels to small areas of land (micro-zones) according to their special characteristics. This yields maps to be used locally in regulating land use and construction practices.

Destructive Earthquake Ground Motion

Soils, Foundation and Earth Structures

The ground beneath the structure must be considered an integral part of the structural system. Buildings, highways, bridges, utility distribution systems, and dams receive their input motions from soils. An extensive program in strong motion instrument placement will be continued. The coupling of earthquake motion to foundations and pilings and the reactions of large scale earth works such as dams and utilities is being studied.

Seismological Field Survey (SFS)

This entails the operation and maintenance of about 900 instruments throughout the U.S. as information sources for the research community. The responsibility for SFS is to be assumed by NSF from National Oceanic and Atmospheric Administration at the beginning of FY 1974.

Structural Dynamic Analysis

Structural Synthesis and Design

Simulation Facility

The object is to determine the effects of detailed joint and assembly design on the damage to experimental structures. Studies are being conducted on the placement of reinforcing bars in concrete elements, the placement of rivets to join steel beams and columns, the sizing of reinforcing bars, and so on, to develop understanding of how to improve practices to prevent failure.

Coastal and Inland Waterways

Utilities and Public Service Facilities

Structures of interest other than buildings include harbors, reservoirs, underground utility systems, electrical generation and distribution systems, bridges, etc. Research efforts on prediction of water levels due to tsunamis will continue.

New initiatives in the design and analysis of electrical distribution systems will be undertaken. These present special design problems in that their mechanical properties are quite different from usual construction materials. The failure of underground conduits (gas mains, fire water distribution, communication cables, storm drains, drinking water lines, petroleum products pipelines) present serious disaster potential for secondary effects such as fires, health problems, and delayed economic recovery. New research efforts in the design and analysis of such systems to prevent failure will be undertaken.

Earthquake Inspection and Technology Transfer

The Managua earthquake of December 23, 1972, and that in Oxnard, California on February 21, 1973, are the latest in an extensive series which have been the object of intensive on-the-spot studies by teams partially supported by NSF. The response of a variety of types and qualities of construction to earthquake motions are of first interest to the NSF Earthquake Engineering Research Program.

Tri-Service Seismic Design Manual

By J. V. TYRRELL and H.D. NICKERSON
Structural Engineers
HQNAVFAC
• Alexandria, Va.

NAVFAC P-355, *Seismic Design for Buildings,* has been substantially revised and now is in printing production. The tri-service manual was prepared principally by A&E contract managed by the Corps of Engineers with NAVFAC and the Air Force participating.

The new edition contains a number of changes and new provisions that will significantly effect the design of structures. The necessity for the changes is rooted in the accelerated accumulation of earthquake data in recent years coupled with greater capability to analyze past data by computer techniques. It is reinforced by a general feeling in the scientific-engineering community, that the existing codes are inadequate.

Seismic maps presented in the new edition show increased estimates of risk, as reflected by zoning, for a number of locations important to the Navy. For example, portions of California and Alaska have been upgraded from zone 3 to zone 4.

In the eastern U. S., Charleston, S. C. and Boston, have been designated as zone 3 instead of zone 2. Increases in the zoning mean that facilities to be located in these areas will now be designed to resist a greater lateral force than was hitherto the case.

The new zone map is basically one developed by S. T. Algermissen of the National Oceanic and Atmospheric Administration. It appeared in the 1970 edition of the Uniform Building Code (UBC). It has been modified to include zone 4 as a result of recommendations by the DOD working group on structural design after consultation with the originator and other recognized authorities in the field of seismic risk.

Another new provision is the concept of high loss and low loss potential structures. By use of such categories, an attempt is made to recognize that damage to certain

structures would be more critical than for other structures. High loss structures are those that involve human safety or an important operational mission. If the design earthquake occurred, high loss structures would be expected to remain operational whereas low loss structures might be severely damaged but would not be expected to collapse.

Low loss potential structures located in seismic zone 4 will be designed to resist the forces equivalent to zone 3. The extent of the mandatory requirements for design details are also less stringent for low loss potential structures. The intent is to allow greater economy in initial cost. This seems a rational approach given the still highly uncertain nature of the forces which should be used as a basis for design. Only further experience will determine if this approach is satisfactory and cost effective.

The basic reference in the aforementioned P-355 has been changed from UBC to the Structural Engineers Association of California (SEAOC) code. Seismic provisions of the UBC are basically an adaption of the SEAOC code, but this latter code has been updated more recently. The SEAOC code seems to be moving toward a less arbitrary approach based on engineering analysis. Future editions of P-355 will probably continue to use the SEAOC Code as it is updated.

The cost impact of the structural system by changing from zone 3 to 4 or from zone 2 to 3 is being studied. Obviously it will depend to some extent on the type of structure and the site conditions. Sections of mechanical, electrical and utilities have been added also in the new edition of the manual. These new requirements will increase mechanical, electrical and utility construction costs somewhat. It is too early to say that we have the complete picture on costs but it appears that total costs will increase by about 2% on the average, for the common types of buildings such as personnel, training buildings, and administration buildings. In an area where designers and contractors are unfamiliar with seismic details, the cost may be initially higher. High rise buildings, structures with large masses on upper floors, and unsymmetrical structures may be expected to have greater cost increases.

The recent changes in criteria has increased the design requirements for many important navy installations. Existing facilities were designed to meet lesser requirements and their adequacy for the new standards is questionable. It was therefore decided that earthquake vulnerability studies should be made.

A pilot study of typical structures was made to determine their structural vulnerability. The study indicated that most existing structures are acceptable even though designed to lower standards. However, substantial damage could be predicted for several important structures if subjected to the more severe earthquake now considered to be a possibility. A more detailed and exhaustive investigation is needed to determine what action should be taken with respect to these structures. Similar pilot studies are required for mechanical, electrical, and utilities systems. From the results of these studies corrective procedures can be determined.

Seabees Aid Supply School Tornado Recovery

• Gulfport, Miss.

A 12-man Seabee tornado-disaster recovery team from CBC Gulfport answered a call for help in clearing damage at the Naval Supply Corps School, Athens, Georgia, inflicted by a "no-name" tornado on Memorial Day. The team of six equipment operators and five construction mechanics was headed by Lt. (jg) John M. Cherry, CEC, USN, of the 20th Naval Construction Regiment, and CMC Charles H. Sisson, regimental equipment coordinator.

The tornado, one of a series that had struck across the deep central southland, hit without warning about 5 p.m. May 30th, tore off roofs, sent doors and other debris flying through living spaces and uprooted trees with its force. Luckily, no one was injured.

At Athens, victim for the second time in two weeks of destruction by tornado, the Seabees cleared debris, removed fallen trees, completed demolition and removal of several heavily-damaged housing units, and extricated tree limbs that had been driven into walls by the powerful winds.

"A resident of the area said it was like hearing a freight train come on you without warning," Chief Sisson reported. "Fortunately there were no children in upstairs bedrooms at the time," Sisson continued, "but some people had to dive under stairwells and into other protected areas to avoid harm from the tornado."

The Seabee team finished its work and departed for Gulfport June 7, 1973.

Lieutenant Cherry had recently returned from Kusae Island in the Pacific Trust Territories, where he headed Seabee Team 13310 in a civic action program. The team built roads, constructed a dam and set up a system to bring water into the homes and public buildings for the first time.

By HAROLD BRAUN
Public Affairs Officer, CBC Gulfport

Chief Sisson (left) and Lieutenant (jg) Cherry (right) flank 10-man team of Seabees from Naval Construction Battalion Center, Gulfport which assisted tornado clearance effort at Naval Supply Corps School, Athens, Ga. Kneeling (left to right) are CM3 Charles Westmoreland and EO2 Leonard Fuerst; standing in second row are Chief Sisson, EOCN Nicholas Branka, EOCN George Gambrone, CM2 Douglas Joyner and Lt. Cherry; in back row are EOCN Warren Sullivan, EOCN Dennis Sturgill, EO1 William Cupp, CM2 George Benhart and CM3 James Robertson.

Navy Hospital Solid Waste Handling Systems

By SHERRILL E. SMITH
Personnel Support Construction
• Alexandria, Va.

The quantity of solid wastes generated in hospitals has increased significantly in recent years. In 1955, the average quantity of burnable waste material was 5.5 pounds per patient per day. Today it is in the 15-20 pound range, and is expected to continue to increase.

Along with the rise in quantities, the labor costs for handling solid wastes in hospitals have also increased markedly. As a result, hospital operating costs associated with solid waste handling and disposal has become a significant percentage of the total operating cost. A survey conducted by a West Coast engineering firm revealed that the total cost of solid waste handling and disposal ranged between $2 and $5 per bed patient day in seven hospitals, and the on-floor handling of wastes averaged 80 percent of the total cost.

A study of waste handling systems was, therefore, initiated by the Engineering Division of the Naval Facilities Engineering Command for the purpose of evaluating the various types of automated systems for the purpose of reducing costs. At the same time, new systems such as the pneumatic tube type, which represents a substantial initial investment, could be analyzed for life-cycle cost effectiveness. This study analysis did not include pathological and infectious or contagious wastes. These wastes are usually collected and disposed of separately and represent only a small percentage of the total wastes.

Determining Quantity of Solid Wastes

Before evaluating the application and cost effectiveness of the various types of waste handling systems, it was considered necessary to determine the quantity of solid wastes generated at Navy hospitals and whether these amounts deviated from the private hospital norms.

Since Navy hospital sizes vary from 80 bed up to the 600 bed range, the survey data was related to four (4) hospital size categories — 100, 250, 400 and 600 beds. Table I contains the results of the survey by types of wastes as well as quantity. Because the disposable items being utilized varies at different hospitals, the amounts in the table were adjusted

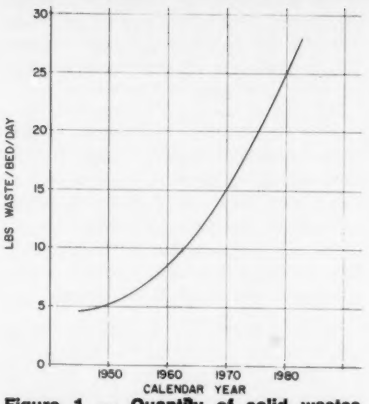


Figure 1 — Quantity of solid wastes generated in hospitals.

for standard operation (without disposables) and for 100 percent disposable operation. In addition, the quantity of wastes generated were increased to allow for a future increase of loads so that the size of the equipment selected will be adequate for the life of the equipment.

The survey revealed that the amount of general wastes in pounds per patient bed remained approximately the same for the 100 to 250 bed sizes, whereas the 400 and 600 bed hospitals each generated approximately 33 percent more general wastes. On the other hand, the amount of food wastes in pounds per meal remain almost the same for all size hospitals. These results correspond with studies which have been made at private hospitals.

Internal Transportation of Solid Wastes

After determining the amount of solid wastes that the various types of equipment must handle, the different methods of internal transportation and waste processing systems were analyzed first for suitability, and secondly for the cost benefits of the selected systems.

In order to be considered suitable, a hospital trash collection system should remove wastes rapidly and reliably under controlled conditions. By controlled conditions is meant the elimination of health and safety hazards and removal of the solid wastes with minimum pollution effects. The prerequisite for the selection of each internal transportation system was the ability to accomplish these requirements.

The internal transportation system can be divided into three fundamental types of systems — carts, chutes and pipelines. Manually operated carts require the greatest use of manpower. Hence, hospitals presently using this method have experienced high waste handling costs. This system, however, was included in the final cost analysis for comparison purposes with semi- and fully-automated systems.

The study analysis included both the simple, inexpensive, gravity drop chute, which have been in use for years, as well as the newer, expensive, completely pneumatic chute systems. Although gravity chutes at one time were considered a fire hazard, this shortcoming has been overcome with sprinklers and fire-rated, refractory-lined chutes.

Refractory-lined chutes are airtight and, therefore, overcome the objections of the potential spread of pathogens in the hospital. The fully pneumatic chute systems, although considerably more expensive, provide both vertical and horizontal transportation and convey the wastes from the upper floor depository stations directly to the compactor, or other processing equipment, at the loading dock without intermediate handling. Both gravity chute and pneumatic chute systems were included in the life cycle cost analysis.

The third basic mode of transportation is by pipeline. This method requires either wet pulping or dry shredding of the wastes. The wastes are either pumped in a slurry or air-blown through a pipe after shredding

Table I. HOSPITAL PROJECTIONS – NAVY HOSPITALS

	100 BEDS		250 BEDS		400 BEDS		600 BEDS	
	STANDARD OPERATION	100% DISPOSABLE OPERATION	STANDARD OPERATION	100% DISPOSABLE OPERATION	STANDARD OPERATION	100% DISPOSABLE OPERATION	STANDARD OPERATION	100% DISPOSABLE OPERATION
Meals Served	400	400	1000	1000	1600	1600	2400	2400
Total Waste - lb	2100	3060	5250	7650	10400	15040	15600	12580
General Waste - lb	1500	2300	3750	5750	8000	12000	12000	18000
Food Waste - lb	600	760	1500	1900	2400	3040	3600	4560
General Waste - lb/bed	15	23	15	23	20	30	20	30
Food Waste - lb/meal	1.5	1.9	1.5	1.9	1.5	1.9	1.5	1.9
Soiled Linen - lb	1400	NIL	3500	NIL	5600	NIL	8400	NIL
Soiled Linen - lb/bed	14	NIL	14	NIL	14	NIL	14	NIL

to a collection point at the loading dock.

Processing of Solid Wastes

The study analyzed the four basic methods of processing solid wastes—shredding, compaction, pulping and incineration. These basic concepts were analyzed for both proven operational reliability and effectiveness in respect to total system benefits. Only those processing methods with superior benefits as described below were included in the life-cycle cost evaluation. Each selected processing system must satisfy the same requirements as the internal transportation system in respect to health and safety hazards, and pollution effects.

Shredding of solid wastes reduces the volume and provides a means of transporting the wastes both horizontally and vertically from the collection point to the loading dock area of the hospital. Although ideally suited for transporting processed wastes by relatively small pipes, the equipment hardware has not had proven success in operation. This type of system has been plagued with numerous operating problems. In addition, they are very noisy and expensive for the results achieved. Consequently, this type of system is not recommended at this time and was excluded from the life cycle cost analysis.

Compaction of solid wastes reduces the volume which reduces the labor costs of handling. Compactor types are available which can be placed directly below a gravity chute and which operate automatically and unattended until the storage compartment has been filled.

Two types of systems have had proven operational success. One type employs a single 1 or 2 cu. yd. container and the other type utilizes a carrousel or in-line arrangement of 4 to 10 containers which also operates automatically. The single container type is preferred because it is less complex. It has the disadvantage, however, of a higher unit weight handling problem when the trash room is below grade. Compactors have a high degree of proven reliability in service and are inexpensive. Compactors were included in the life cycle cost analysis.

Pulping of solid wastes is similar to shredding in that the material is reduced to a homogenous mixture which can be piped in any direction to the loading dock area for removal from the hospital. Pulping, however, uses water and the pulped material, although dehydrated at the end of the line, still weighs more than the original material. Because of this disadvantage and because broken glass and metal grindings have caused excessive equipment and plumbing wear in the pulping of general hospital wastes, pulping systems are not recommended for general wastes.

The pulping of food wastes, however, has been successful, and is recommended whenever the food wastes cannot be put directly into the sewer system by garbage grinders. Direct disposal of food wastes into the sewer line is by far the least expensive and most efficient method of disposal.

Incineration gives the highest weight and volume reduction by consuming all that is combustible. As such, it also constitutes a disposal method. Only 5-10 percent of residual ash must be carried to a landfill. Incinerators, although poorly designed in the past with resultant smoke emissions, can be designed to meet the most stringent pollution control standards. These modern incinerators are expensive and generally cannot compete on a cost per ton basis with disposal by landfill or municipal incineration.

Small-sized incinerators, however, are usually used at hospitals for pathological and infectious wastes, which present a very special disposal problem. There is a trend, nevertheless, to prohibit the incineration of any and all types of hospital wastes. Some counties in the State of California have passed such a law, and, in addition, prohibit the transporting of all infectious hospital wastes over public streets. This presented a dilemma to the hospitals for the disposal of infectious wastes. No apparent means for disposal of the infectious wastes was available. Their solution, after experimentation, was to grind all infectious wastes into the sewer system for treatment and disposal in the sewage treatment plant. Even though the amount of infectious wastes represents only about 4 percent of the total hospital wastes, the success and acceptance of this disposal method has opened up an entirely new avenue of hospital waste disposal which has higher esthetic and lower economic potentials than any other system.

Furthermore, at least two different hospitals are experimenting with the grinding of all of the hospital wastes and, apparently, have been reasonably successful. This new concept is a recent development and will require an additional study and analysis of feasibility, acceptability and comparability with present waste handling systems.

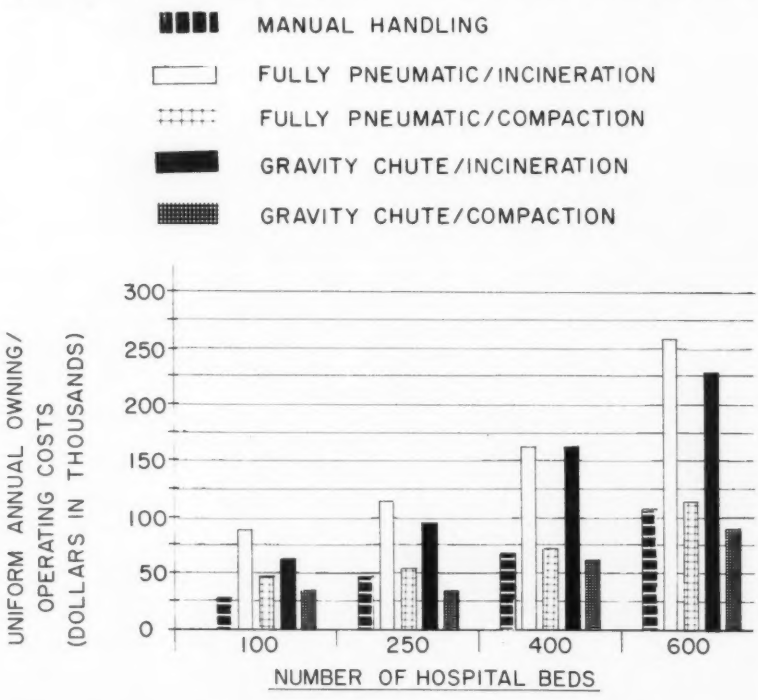


Figure 2 — Summary of economic analyses of solid waste systems.

Economic Analysis of Selected Systems

On the basis of the following preselection analyses, the final combination internal handling and processing systems were selected for cost-effective comparison. Each of the selected systems were analyzed for each hospital size — 100, 250, 400 and 600 bed. The cost analysis was conducted in accordance with SECNAV Instruction 7000.14.

The study compared the total owning and operating costs (over a 25 year period) of four automated systems — two pneumatic tube systems and two gravity chute systems, each feeding into either a compactor or an incinerator. A manual handling system was included for comparative purposes.

The gravity chute/compaction system has the lowest uniform annual cost for all hospital sizes except the 100-bed hospital size. However, if the reduced costs of handling wastes from the hospital by volumetric reduction is considered, this system will also be the lowest cost system for the 100-bed hospital size. This cost analysis is based on new construction and assumes a 200-foot distance from the collection point in the hospital to the loading dock. A special study must be conducted at those hospitals which deviate from this norm. The cost figures show that pneumatic tube systems are not cost effective in the size range of Navy hospitals. The initial investment is too high. The cost figures also show that on-site incineration is far more expensive than processing by compaction. This is based on average costs of compacted waste haulage to an ultimate disposal site. If these costs are exceptionally high, a detailed cost study should be made for that specific case. The high cost of incineration as related to other systems is primarily due to the requirement for expensive air pollution control equipment.

Summary

The following recommendations summarizes the finding of this study:

- A gravity chute/compaction system should be installed in all new Navy hospitals. This type of waste handling system should be the most cost effective. However, if haulage costs to the disposal site are excessively high or some other feature is uniquely different, a special study should be conducted to determine the least cost system.
- The compactor should be installed at the bottom of the gravity chute in a trash room to automatically receive and compact the wastes. The type of compactor may be a single compartment, 1 or 2 cubic yard container or a multiple arrangement of 6 to 10 containers in a carrousel or in-line configuration. The equipment should be designed to automatically unload the material into the containers.
- Gravity chutes should be the UL-rated, refractory-lined type. This type of chute will eliminate the fire hazard, be less noisy, and prevent the spread of pathogens from the chute.
- Food grinders should be used for kitchen wastes whenever ground-up food wastes can be accepted by the local sewage treatment plant and codes will permit their use.
- All food wastes, in those hospitals where disposal to sewage treatment plants is not permissable, should be pulped in the kitchen preparation room and in the cleanup area, and the pulp disposed of in the same manner as the hospital general wastes.

By LT. D. M. COSGROVE, CEC, USN

• Alexandria, Va.

The Navy faces a critical problem of community encroachment on air installations. Most naval air stations have historically been located in coastal population centers and, as a result of the continuing increase in population, have been faced with the problem of dense population growth adjacent to station boundaries.

This situation has resulted in severe safety and noise pollution problems now confronting the Department of the Navy as well as the other services. Recognizing the seriousness of the problem, the Department of Defense is reviewing policy for the development of air installation compatible use zones (AICUZ) around all military air installations.

The composite noise rating (CNR) system is currently used to determine three degrees of noise impact on the community from the worst (CNR 3) to the best (CNR 1). Tentatively, the AICUZ includes all land in the CNR 3, and that part of CNR 2 which lies within one mile of either side of the runway centerline and up to two and one half miles from the thresholds, plus any area with a historical concentration of accidents.

The goal of the program is to ensure compatible development in the AICUZ. Compatible uses include agriculture, grazing, non-spectator sports and low-density recreation, light industry, storage, and other activities including those housed in structures providing adequate noise protection. Prohibited uses in the zone include residential areas, hospitals, schools, churches, and other facilities designed for the assembly of large groups of people.

The Navy intends to achieve this goal by working closely with community officials in zoning or rezoning matters as they affect naval air stations, particularly mindful of methods for eliminating or reducing noise pollution problems; by purchasing restrictive easements which prohibit non-compatible development, or in some cases, fee acquisition of parcels of land.

The types of zoning, easements, and the land areas required will be determined through detailed studies to be conducted at all naval air installations within the next two years.

A key to the success of the AICUZ program will be the relations of the stations with the community. Open participation by key station personnel in community zoning and planning actions, open access by local community personnel to non-classified flight patterns and frequencies, and a general good-neighbor policy are the first steps.

Program AICUZ is just beginning. The problems encountered under the program are almost overwhelming. Any delay would increase the cost and complexity of the solutions. A five-year program has been developed to cover each of our installations. Studies are presently being compiled and acquisition projects will begin in FY '75.

Planning the Pollution Battle

By CDR J. B. GROFF
Environmental Protection Coordinator

The navy is devoting an increasing proportion of its resources to protection of the environment. As we become more aware of the effects of pollutants upon mankind, it is apparent that the navy must do its share to protect the source of our concern, mankind.

Environmental pollution is defined as a condition resulting from chemical, physical or biological agents in air, water and soil which so alters mankind's environment as to create an adverse effect on all forms of life and even structures and natural beauty. The increased awareness of pollution and its effects has resulted in national concern and action by the public, Congress, and the President. Public action has typically taken the form of various environmental organizations, Congress has passed environmental laws and the President has issued executive orders. All in response to threats to the quality of our environment. In terms of navy action to this concern, the navy is pledged to cooperate with all agencies involved in environmental protection and comply with the most rigid standard promulgated by any of them. As the navy's shore facilities engineering and construction agent, NAVFAC is naturally greatly involved in navy actions.

The 92nd Congress passed Public Law 92-500 by an overwhelming majority, thereby amending the Federal Water Pollution Control Act. It is a far reaching law, and

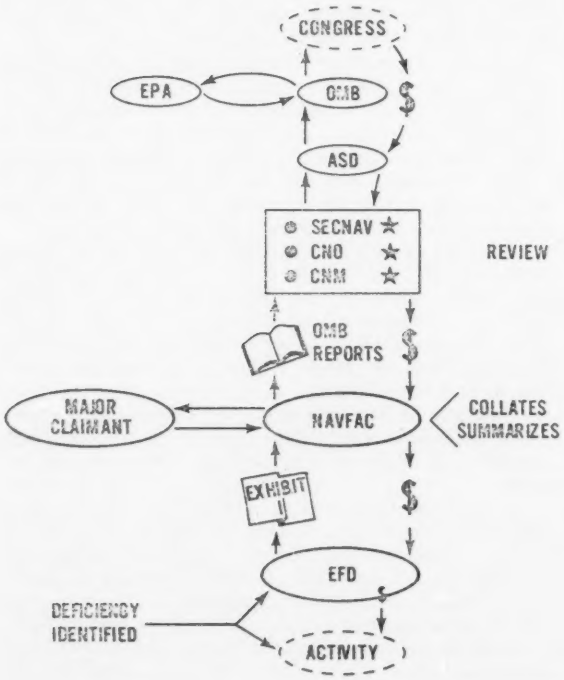


Figure 1 — Flow chart shows routing for getting funds and approvals for correcting pollution problems.

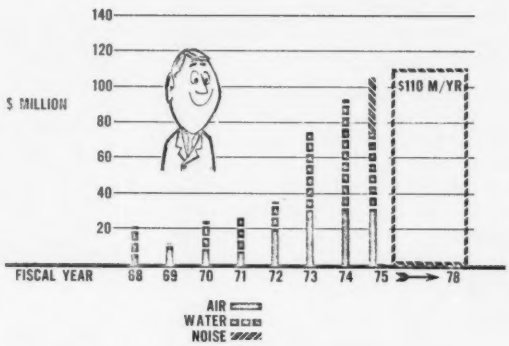


Figure 2 — MILCON pollution control program.

the most significant piece of environmental water legislation ever to come out of the U.S. Congress. The amendments to the Water Pollution Control Act, and resultant state and local regulations have led to NAVFAC constructing such project as industrial waste treatment plants, connections to municipal systems, pier sewers to receive ships' wastes and improvements to 'exsisting waste treatment plants, to mention but a few at naval shore facilities. Further the increased concern for the environment obliged NAVFAC to devote more of its engineering talent to this vital area. Accordingly, NAVFAC, in the instance of water, is involved in engineering programs to update criteria and definitives, develop an ultimate ships waste offload system, provide standard ship-shore waste connections, and type specs for package sewage plants.

Public Law 91-224 prohibits the discharge of oil in contiguous zones. In response to Public Law 91-224, and its ramifications, the Naval Facilities Engineering Command, working closely with both the Naval Supply Systems Command, and the Naval Ship Systems Command, has developed requirements for such oil pollution control items as skimmers, booms and oil/water separators, and has participated in surveys of activities to reduce oil pollution potential and in the development of reclamation facilities to process oily wastes.

The Clean Air Act Amendments of 1970, Public Law 91-604, resulted in further actions to cleanse the air we breathe. It is the law which established national ambient air quality standards, published categories of stationary source emissions, and promulgated hazardous air pollutant standards. In response the navy has been involved in such projects as fuel conversions, sanitary landfill development, abatement of smoke from fire fighting training and optimizing classified material destruction. To meet the evolving standards in this environment, NAVFAC is currently developing design criteria, and definitive designs for air pollution abatement and is embarked on a program to tune up power plants such that they will not only be more ef-

ficient and hence, more cost effective, but will also present less pollution to the atmosphere.

Closely allied with air pollution is the solid waste problem. Here also NAVFAC is involved, investigating the latest state of the art for potential navy use. In regards to recycling, NAVFAC is working closely with EPA in their evaluation of cost effective processes.

Public Law 92-574, for the first time, defines noise as a pollutant. While the impact of Public Law 92-574 cannot be fully assessed at this time, it is anticipated that the navy shore station response will be contained in a forthcoming instruction speaking to AICUZ, or air installion compatible use zones. You may recall, that the Composite Noise Rating System (CNR) essentially established three zones. An improvement on this system is the Noise Exposure Forecast (NEF) system, which augmented CNR with tone and noise duration. Utilizing the noise exposure forecast system, noise contours are drawn to anticipate the compatibility of mankind to various sounds. With this information, the land around our naval activities can be zoned to permit man and the noise he produces to live in harmony. AICUZ is designed to limit encroachment around air stations by providing flight safety zones and protection from noise.

We have spoken in general about some of the typical engineering actions in which NAVFAC is involved. It is apparent that we should now speak to how the activity becomes involved and benefits from a program of the magnitude of the Environmental Pollution Abatement Program.

In carrying out the directives of the President and the intent of Congress to protect our environment, the Office of Management and Budget has promulgated direction which ultimately manifests itself in what is known as an OMB report, which is updated quarterly, identifies deficiencies of a particular agency, in our case, the navy, in regards to compliance with environmental laws and regulations promulgated by federal, state and local agencies. The OMB report, which is updated quarterly, identifies deficiencies, the cost of the solution to the deficiency, and programs a year of accomplishment for solution for each major environment; that is air, water and noise, and, in actuality, forms the basis for our budget submittals through the chain of command to Congress.

Figure 1 attempts to diagram the involvement of the various federal components, including the activity, in seeking funds to correct pollution problems. Note that a deficiency most commonly is identified at the activity level or at the NAVFAC engineering field division level; however it may also be programmed at the major claimnant level. As a specific example, let us take the case of a navy activity which provides only primary treatment to its sewage effluent. If the state law requires secondary treatment, a deficiency exists. This deficiency is identified on a piece of paper known as an Exhibit I. The Exhibit I's for all activities within the geographical cognizance of an engineering field division are assembled by the EFD and forwarded to the Naval Facilities Engineering Command in Washington where they are collated and summarized in the three books called OMB Reports. These reports, which now contain the total world-wide deficiencies are forwarded through the chain of command to OMB. At the time of forwarding, major claimaints receive a copy for coordination/review purposes. EPA, acting as a consultant to the Office of Management and Budget, also reviews each project for validity and assigns a priority.

The OMB Report contains a summary of all appropriations required to abate pollution and accordingly indicates OPN, P&MN, Military Construction, PA&MN, and MC-NR funds required for pollution abatement as identified at a particular point in time. It should be pointed out that, by definition, OMB has stated that funds can not be requested for recurring costs such as those associated with normal maintenance functions, personnel salaries, etc.

As previously stated, the OMB Report forms the basis of the budget submission to Congress. With favorable congressional action, funds are channeled down through the chain of command via existing procedures to the activity for correction of the deficiency. Status of the correction is updated in the OMB Report. By executive decree, funds appropriated for pollution abatement cannot be used for any other purpose.

As shown in the flow chart, (Figure 1), the Chief of Naval Operations reviews the total deficiencies as contained in the OMB Report and, each year, issues program development guidelines. This policy document reflects what he considers to be the most important deficiencies requiring correction. Each command receives a copy of these guidelines.

Congress has provided excellent support of the projects contained in the OMB Report and programmed by the navy for accomplishment. Figure 2 depicts the pollution abatement MCON program while Figure 3 shows past, present and future NAVFAC O&MN funding. The NAVFAC O&MN funded program depending upon the impact of the noise laws is anticipated to tail off after FY 1975, with the data base program claiming the majority of the dollars.

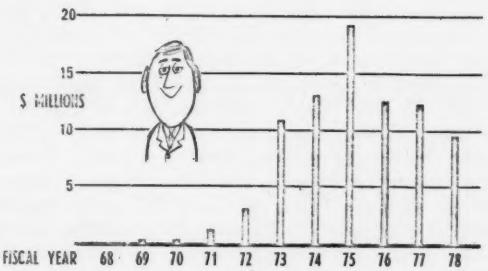


Figure 3—NAVFAC O&MN pollution abatement program.

In addition to its environmental involvement in construction and public works, the Naval Facilities Engineering Command also carries on certain environmental improvement efforts. Self-help efforts at our Seabee centers and Public Works Centers have resulted in lakes and trees and playgrounds. NAVFAC has long been involved in forest management and conservation efforts and provides expertise to all activities in these areas. Our CEC officers are frequently involved in presentations to civic groups concerning navy environmental improvement programs and recycling has become popular at the Seabee centers. Further, the public works center at San Diego has developed a garbage cooker and a mobile classified material pulverizer to meet local needs in this area.

Past efforts, some of which have been recited here, notwithstanding, a substantial amount of work still lies ahead, for, in the words of ADM. Elmo R. Zumwalt, Jr. "The Navy is a dynamic force in environmental protection and enhancement". Our goal is clear. Meeting it requires talent, dedication, imagination and sound engineering judgement which includes proper perspective of priorities.

Dredging Goes Environmental

By C. BITTENBRING and G. A. LEIGHTON
Operational Facilities Construction Division
• Alexandria, Va.

Recent emphasis upon the environment has forcefully impacted upon navy dredging operations. What were formerly routine and repetitive procedures have now become complex and controversial because of a widening area of interest groups which includes the conservationists, scientific community, regulatory agencies and private interests.

The navy has interest in three types of dredging projects; (1) Military Construction Projects (MCON), (2) maintenance dredging at existing facilities, and (3) the use of navigation channels maintained by the Corps of Engineers, (C of E), U. S. Army. The navy budgets and secures dredging permits in the first two cases; however, the C of E is responsible for navigable waterways which serve commercial and navy shipping.

The scope of navy dredging requirements for MCON varies each year but normally ranges from 2 to 4 projects. Maintenance dredging ranges from 6 to 10 locations each year and approximates 10 million cubic yards/year. Cost for this amount of maintenance dredging has averaged about $6 million in the past. While the navy is responsible for maintenance dredging alongside its waterfront structures and related turning basins, the maintenance of navigation channels from the open sea to navy and commercial port facilities is the responsibility of the C of E. In these cases, the navy is dependent upon the C of E for timely dredging maintenance. As an example, the C of E maintains the Norfolk Harbor Channel to a 45' depth, 1500' width and 13 mile length, while the navy is responsible for dredging at the piers at NAVSTA, Norfolk. MCON dredging is normally accomplished by a private dredger under navy contract. Navy maintenance dredging is accomplished by contract (Navy or C of E) or government dredge (Navy or C of E). The navy has hydraulic dredges presently assigned at NSY Charleston, NSY Mare Island and PWC Subic Bay. The C of E channels are maintained either by C of E contract or by C of E dredge.

The basic legislation assigning dredging responsibilities to the C of E is contained in the Rivers and Harbors Act of 1899. Recent legislation affecting dredging includes the Federal Water Pollution Control Act (PL-92-500) and the Marine Protection, Research and Sanctuaries Act (PL-92-532). The Environmental Protection Agency (EPA) is now the final regulating authority although the C of E issues dredging permits. The main thrust of these legislative actions on navy dredging is a substantial increase in cost. If laboratory analysis reveals that the allowable standards for organic materials or heavy metals are exceeded, the dredged materials must be carried longer haul distances for ocean disposal. Dredging permits take up to one year for approval, during which time cost escalation becomes significant. Increased design and administrative costs result from the need for environmental impact statements and material sampling. Extensive monitoring efforts are frequently required to measure the effects of disposing dredged materials. A complete monitoring program for dredging recently accomplished at NAVSTA Mayport cost approximately $90,000.

The navy is reacting positively to face the problems now associated with dredging. In those cases where navy has funding responsibility, the requirements have been inventoried with objectives to analyze samples, select disposal sites and method of accomplishment, develop cost estimates, initiate permit requests as early as possible, prepare environmental impact assessments, monitor dredging effects and accumulate data for the Navy Environmental Data Base Program. Where navy has a user interest, liaison is being maintained with the C of E to support channel maintenance projects so that fleet operations are unimpeded. Long range considerations may result in the development of MCON projects to dispose of material ashore or to reduce silting rates at navy bases.

All indications are that the regulations concerning dredging, and particularly the disposal of dredged material, will become increasingly more stringent as the nation strives to minimize or eliminate adverse effects upon the the environment. The navy's dredging must therefore be accomplished based on careful planning and execution within a controlled environmental framework.

Command Changes at CBC Gulfport

• Gulfport, Miss.

"Serving with, and in support of the Seabees of the Navy is the most professionally rewarding and most soul satisfying duty that any Civil Engineer Corps officer can have. In my own experience, to have had the honor of commanding a battalion during the war in Vietnam was a challenge with its own special rewards in seeing a difficult job done well. To now have the opportunity to command this Seabee Center and regiment is to be twice blessed in one lifetime."

Those sentiments were expressed by Capt. Ward W. deGroot III, CEC, USN, as he assumed command of the Naval Construction Battalion Center and the 20th Naval Construction Regiment here July 12, 1973. While hundreds of spectators basked in early morning sunshine, Capt. deGroot relieved Capt. William M. Zobel of the dual commands. Capt. Zobel had assumed his commands July 30, 1971.

RAdm. Foster M. Lalor, director of naval shore installations, was the guest of honor.

Capt. Ward W. deGroot III, new commanding officer of Naval Construction Battalion Center, Gulfport and commander, 20th Naval Construction Regiment, directs a parting remark to his predecessor, Capt. William M. Zobel, who transferred to an OPNAV billet in Washington.

Navy and Marine Corps Conservation Awards

By ROSS LEONARD
Fish and Wildlife Consultant

• Alexandria, Va.

On 29 March 1973 the Conservation Award Selection Committee, appointed by Rear Admiral Enger, met to select the winners of the conservation awards presented annually by the Chief of Naval Operations and the Commandant of the Marine Corps. This committee of nationally-recognized conservationists represented the three primary disciplines of our program; soil and water, forestry and fish, and wildlife. It was composed of Gordon K. Zimmerman, executive secretary of the National Association of Conservation Districts; James B. Craig of the American Forestry Association and Lonnie L. Williamson of the Wildlife Management Institute. Overall direction of the Navy Department's Natural Resources Program is provided by the natural resources staffs of NAVFAC headquarters and field divisions real property management organizations.

The purpose of giving these awards is to stimulate interest and add incentive for active participation in the conservation program; not only in the three primary fields, but in the total environment, including pollution control, water quality and natural beauty.

It is recognized that the Navy Department has an obligation to the American people to restore, improve, preserve and enhance, through wise use and proper management, all natural resources, present and potential, on all navy installations.

The following installations submitted nominations:

NAVY

a. Installations containing over 5,000 acres:

- NAD Earle, New Jersey
- NAD McAlester, Oklahoma
- NAD Oahu, Hawaii
- NAD Crane, Indiana
- NAS Cecil Field, Florida
- NAS Meridian, Mississippi
- NAS Whidbey Island, Washington
- NAS Lakehurst, New Jersey
- NAS Miramar, California
- NAS Patuxent River, Maryland
- NWS Charleston, South Carolina
- NWS Yorktown, Virginia
- NWS Seal Beach, California
- NWC China Lake, California
- Naval Oil Shale Reserves, Rifle, Colorado
- Naval Petroleum Reserves in California, Tupman, California

b. Installations containing 5,000 acres or less:

- NAS Albany, Georgia
- NAS Chase Field, Beeville, Texas
- NAS Kingsville, Texas
- NWL Dahlgren, Virginia
- Naval Radio Station (T), Cutler, Maine
- NCS San Francisco, California

MARINE CORPS

a. Installations containing over 5,000 acres:

- Marine Corps Development and Education Command, Quantico, Virginia
- Marine Corps Base, Camp Lejeune, N. C.
- Marine Corps Base, Camp Pendleton, Calif.

b. Installations containing less than 5,000 acres:

- Marine Corps Air Station, Kaneohe, Hawaii
- Marine Corps Recruit Depot, San Diego, Calif.

The Conservation Award Selection Committee selected the following winners in the categories indicated:

NAVY

Installations containing over 5,000 acres — Naval Air Station, Meridian, Mississippi

Installations containing 5,000 acres or less — Naval Radio Station (T), Cutler, Maine

MARINE CORPS

Installations containing over 5,000 acres — Marine Corps Base, Camp Lejeune, North Carolina

Installations containing 5,000 acres or less — Marine Corps Air Station, Kaneohe, Hawaii

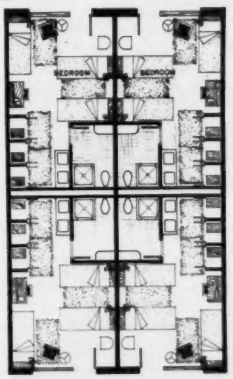
The committee unanimously recommended that the nominations from the Naval Air Station, Meridian, Miss. and the Marine Corps Base, Camp Lejeune, N. C. be submitted as candidates for the Secretary of Defense Conservation Award.

The committee, in its letter to Admiral Enger, stated "We were impressed by the range of activities being undertaken in most instances. We noted a deliberate effort to broaden the resource programs and to add beneficial environmental elements, thereby achieving a more comprehensive approach to problems and a better balance between resource and human objectives."

PROTOTYPE DESIGN FOR MARINE CORPS BEQ

By DANIEL D. CERBONE
Design Division

• Alexandria, Va.



At the request of the Commandant of the Marine Corps, a prototype design for Marine Corps bachelor enlisted quarters is being prepared by A&E contract. This multi-use design will provide plans and specifications which can be site-adapted for the various climatic, wind and seismic conditions at Marine Corps installations. The designs will include those needed for the newly designated seismic zone 4 areas (in which structures are to be designed to withstand 50% more lateral load than called for by the previous maximum zone 3 designation), and the reduced "U" factors (reducing allowable heat transmission through the building walls, roof and floor) specified in the recently revised DOD Manual 4270.1-M.

The standard-size building module will be of masonry construction and will have 16 three-man bedrooms on each side of a central service area on each of the three stories, for a total of 96 bedrooms. Each building module can be increased or decreased by a standard unit of 12 bedrooms. There will be a private bath for each bedroom. The central module will have a lounge, laundry, storage and cleaning gear rooms, vending machines, telephone and mail boxes on each floor, with an office on the first floor.

The design will provide a company administration/supply module for use when needed, two alternate architectural treatments, and interior design guidance for outfitting the BEQs. In addition, the contractor will use the prototype design for preparing complete contractural documents for the FY 74, 576 man BEQ at MCRD Parris Island, South Carolina.

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Shower, head, and laundry facilities for 13-26 men. Non-expandable unit, ships and operates from 8' x 8' x 20' container mode. Electric power, water and drainage field are shipped with the unit. Gross Weight: 7,615 pounds. Estimated production cost: $19,000.

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Medical/administrative space for small camp or detachment of 13-26 men; contains shower head, 4 bunks and furniture. Can operate as small headquarters and dispensary unit. All equipment and furniture, for operation, ships in the 8' x 8' x 20' container; expands to approximately 8' x 20' x 24'. Requires water and electric power from outside source for operation. Gross Weight: 10,064 pounds. Estimated production cost: $28,000.

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Designed for back-up storage for rations, with refrigeration equipment compartment and 3 storage compartments to provide frozen, refrigerated and dry storage. Equipment compartment has small engine/generator that allows unit to operate without exterior source of electric power during overland shipment. Unit can also operate on commercial power or shipboard power. Gross Weight: without cargo: 9,785 pounds. Estimated unit cost: $34,000.

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TACOSS

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Tactical Container Shelter System Demonstrated at Port Hueneme

• Port Hueneme, Calif.

A display and demonstrations at Naval Construction Battalion Center here on June 7, 1973 introduced the prototypes of 10 Tactical Container Shelter System (TACOSS) units. The structures were designed and fabricated at the Tulsa, Okla. plant of North American Rockwell under a contract sponsored by the Civil Engineer Support Office (CESO), funded by the Naval Facilities Engineering Command and administered by the Resident Officer in Charge of Construction Pacific (ROICCPAC).

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Transportability

A prime requisite was that the units should be readily shipped by land, sea or air in civilian or military transports, and that they should be able to withstand rapid local transfer from the point of arrival to the construction site.

Equally important was that the units should be designed to permit relatively unskilled personnel to assemble them without the need for special tools and equipment.

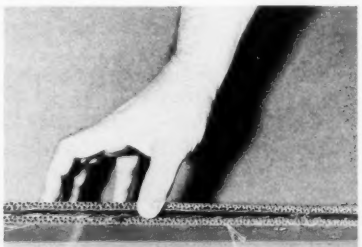
Another essential was that the units be easily and economically recoverable and relocatable through several moves.

The medium to conform to these several needs, and to the essential requirement for an economical design, was evident to CESO's engineers — preconstructed, pre-equipped units that utilized the shipping containers themselves for shelter.

TACOSS Units Conform

The 10 TACOSS structures that were developed satisfy the requirements for economy. Life cycle cost — calculated at production cost levels, with five percent interest and for five deployments over a 10 year period — is less than that of rigid frame buildings.

Superior habitability and minimized construction time, while not measured in monetary terms, obviously increase the economic value of TACOSS. It has been proven that the Type IX unit — the 250-man galley — can be erected in 1/250th of the time required for a standard rigid frame galley.



Wall panels are phenolic-impregnated kraft paper honeycomb between aluminum skin layers.

Structural Features

All 10 of the TACOSS models are designed for a minimum life of five years in use and a minimum storage life of 10 years. The frames are of either steel or aluminum, conforming fully to International Organization for Standardization (ISO) dimensional and loading criteria.

The aluminum-skinned sandwich panels consist of 0.06 exterior and 0.034 interior aluminum face sheets bonded to phenolic-impregnated ¾" cell kraft paper honeycomb core. Total panel thickness is 2" for roof and end walls, 3½ for the floor and 1½" for expandable wall sections. The units were designed to meet the following load criteria:

Floor live load, central	175 psf
Floor live load, expanded	100 psf
Roof live load, central and expanded	75 psf
Wind load, without guying	70 mph
Wind load, guyed	160 mph

Deflection under above loads does not exceed L/280. The units are capable of 3-point suspension without deformation, and calculations using finite element analysis show that they will sustain an 8" drop.

The design requirements called for habitability with outside temperatures ranging from −45° to +125° F. with solar load on outside skin up to 200° F. When ventilating air is restricted, the TACOSS units can maintain tolerable interior ambient temperatures within these exterior temperatures.

TACOSS units I through VII (described on facing page) are for a Seabee Team or a small detachment up to 26 people, with the personnel, subsistence, medical, and equipment/shop units expandable from the 8'x8'x20' container to 8'x20'x24' size with approximately 480 square feet of floor space.

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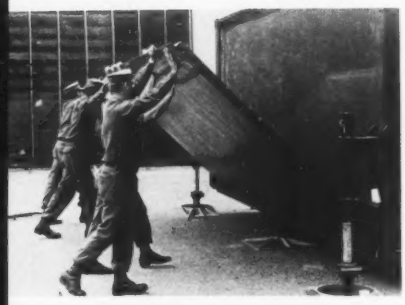

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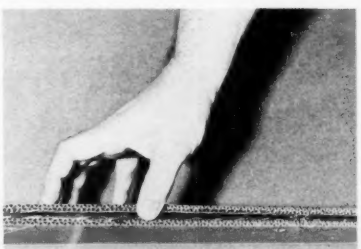

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Developing a Cost/Benefits Model

By C. A. COMPTON
Operations Research
Systems Analysis Division
• Alexandria, Va.

The systems division and the systems analysis division of the Naval Facilities Engineering Command (NAVFAC) Alexandria, Va., have recently teamed up to produce a generalized dollar "worth" model based on subjective judgments as well as conventional cost factors. The information is provided by working proponents in the form of questionnaires along with budget constraints outlined in the Navy Facilities System Manual, NAVFAC P-424.

All incoming information goes through a data reduction sequence in the programmed model which extracts an effectiveness rating based on the input, processing, and output modes within the workload.

This effectiveness rating is based on six definitive attributes which are estimated as percentages for accuracy, timeliness, maintainability, uniformity, applicability, and flexibility.

The subjective appraisals are made by the field experts or proponents on the job and the resultant evaluations are combined as probabilities into a single differentially weighted exponential rating based on the rationale incurred from several modified Delphi surveys.

Our cost/benefit model is programmed to continue to evaluate cost factors and effectiveness in order to provide a bimodal output called Nominal and Intrinsic Worth. The nominal worth portion provides us with a relative scale of values which rank the ADP applications according to their merits whereas the intrinsic worth portion provides us with a relative dollar value for each ADP application. These applications are expressed further as combinations of manual and automated alternatives which provide the decision maker with a running progress account for automating workloads.

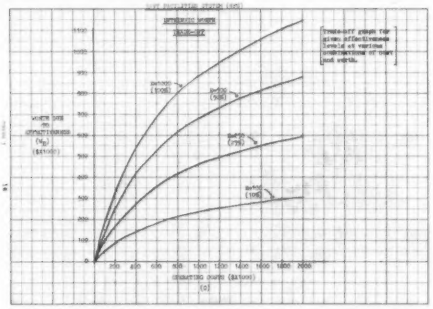
The final print-out also provides the breakout of worth for various applications within the subsystem modules as well as the total Navy facilities system. Considerable flexibility is maintained within the model for adjusting the output according to budget limitations and the utility of costs over fixed ranges.

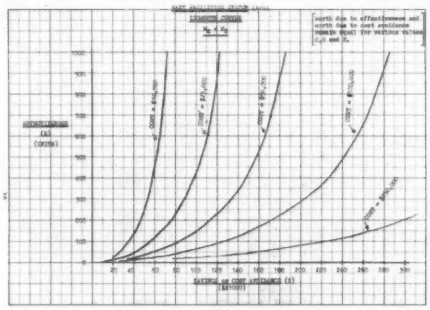
For the past several years, it has been generally recognized by both industry and government that one of the biggest problems in determining the worth of an automatic process is that of defining the intangibles as well as obvious benefits. Cost considerations are not the only criteria used for evaluation. Many ADP applications might have extraordinary initial costs but remain feasible when considering other benefits, both short and long term.

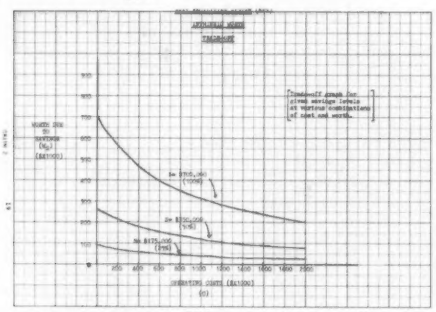
However, economic factors provide the backbone of stability within the model along the lines of classical economic analyses. While most people concede the need for measuring intangible factors, it is exceedingly difficult to quantify and get agreement on what these elements of benefits really are. With the assistance of NAVFAC Headquarters, ADP working proponents, field users, and FASCO, information on these "hard to measure" benefits was compiled and incorporated into the mathematical context of the model.

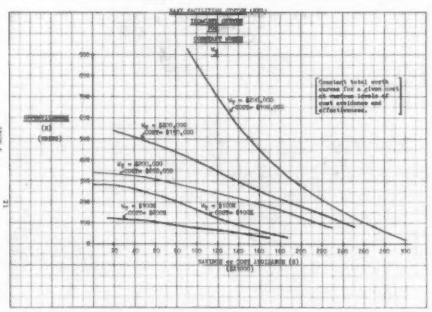
We have gotten considerable agreement on the six factors mentioned earlier and by means of continuous investigation and laborious analyses have been able to extract quantification based on the convergence of expert opinion. For example, one potential user might consider 100 percent accuracy of output as an idealized goal, while another might consider 100% applicability as an ultimate measure, notwithstanding the semantics of the terminology.

Usually life is not simple either in the domain of costs or in the area of subjectve judgments and, at best, our cost/benefit model can be a supple-









mental tool in the decision-making process. A prospective user of ADP can put performance factors and dollar costs and savings to derive its "worth", in addition to comparing its relative value to existing, proposed and future applications.

At present, the model is being tested to determine the validity of results. Should these tests prove reliable for decision making, it will be used by NAVFAC to evaluate all current and proposed ADP applications. Because of the universal need for such a model, it could conceivably be used within other Navy Commands, government agencies, or private industry.

Housing Management Information System

By FRANK LANE

Family Housing Management

• Alexandria, Va.

In an effort to augment efficient and economical administration of operating and maintaining navy's 75,000 family housing dwellings, the Family Housing Management Information System (FHMIS) has been proposed for development utilizing ADP capabilities. The FHMIS will include inputs from all echelons supporting family housing and will provide timely management indicators to these organizational components. It will be installed at a central ADP facility as a standard mechanized system for application at the four Housing Management Centers (HMCs) and at the 180 activities with family housing assets.

This system is being designed to provide nine initial management reports, with additional exception reports planned for future implementation. Once an historical data base has been established, other subsystem reports will be possible for output to satisfy supplemental or occasional NAVFACENGCOM, HMC, Engineering Field Division or activity requirements. FHMIS printouts will depict activities according to homogeneous characteristics in order to achieve realistic comparability in costs, utility consumption, maintenance/repair projects and other quantitative variables.

The FHMIS derives its data from two primary input sources. One input is the quarterly activity Housing Cost Report (HCR) which accounts for accrued expenditures from the Family Housing Management Account. The HCRs are currently processed for output of the family housing operation and maintenance management report. This management report is a summary of activity costs by line item functions and by housing categories, and is one of the nine FHMIS report outputs. The second input to the FHMIS will be annual activity housing budgets. The budget format has been revised for FY 1974 to permit computerization in line with FHMIS specifications.

Work is progressing on various phases of the FHMIS with the intention of implementing the initial management reports during FY 1974. Each stage will be installed in a logical sequence within available fund and manpower requirements. It is planned to have the FHMIS, with complete historical data, in an operational state by the end of 1975.

Evaluating Medical Facility Construction

By C. A. O'CONNOR

Personnel Support Construction

• Alexandria, Va.

In February 1972, the Secretary of Defense, expressed dissatisfaction with the rate of replacement of old, outmoded and inefficient military hospitals. If that rate continued, it would have taken until 1990 to complete the program. Accordingly, he directed that the program be accelerated, and directed preparation of a plan, spreading the remaining projects over the FY 1974 to FY 1978 Military Construction Programs. The Navy's plan envisioned a five year program totalling approximately $688 million for construction and $105 million for collateral equipment.

Realizing the necessity to obtain the most and best construction for the money, NAVFAC and BUMED are undertaking a joint review of completed construction. This review will cover the broad spectrum of planning, programming, engineering, design, construction, maintenance, and operation of medical facilities including the provision of collateral equipment. Features will be identified so that those having special merit can be included in future work while those proved undesirable will not be repeated.

The evaluation will be accomplished mainly by performing an in-depth analysis of the recently completed Naval Hospital Memphis, with additional reviews of problem areas identified at beneficial occupancy for several other medical facilities. An evaluation group composed of representatives of BUMED and NAVFAC will inspect the Memphis Hospital and interview the staff. This is expected to lead to items requiring detailed investigation and analysis which will be organized into specific task assignments for action by specialty teams covering architectural / structural / siting, mechanical, electrical, equipment and public works management. These teams will address all assigned issues, develop check lists and perform on-site reviews. A report and recommendations will be submitted to an executive committee for follow-on action by all interested parties. Individual committee members will initiate appropriate action within their own commands, working cooperatively toward improving criteria, standards and procedures.

Careful thought has been given to specialty team composition. To maximize benefits of this effort, direct participation of those heavily involved in hospital work currently underway as well as that programmed for the immediate future will be included. The Pensacola Hospital AROICC will join with designers and planners of the Cherry Point Hospital; SOUTHNAVFACENGCOM people will attend to obtain meaningful feedback for current and future work; local public works representation will assure their interest is considered and broad NAVFAC participation will include design, construction, maintenance, planning and CEC staffing. Finalization of the draft of NAVFAC DM-33 for medical facilities will be delayed until results of the evaluation are available.

Radiological Affairs Support Program

By GLENN W. ZIMMER

Radiological Safety Officer

• Alexandria, Va.

To assure the protection of Navy personnel, the public and the environment in the handling and use of nuclear materials, the Chief of Naval Material (NAVMAT) established the radiological affairs support program (RASP).

The Naval Facilities Engineering Command (NAVFAC) was assigned responsibility of the program as a result of its expertise in this area through a viable radiological protection program of its own.

The program provides for a unified approach to radiological affairs within NAVMAT. Technical support to NAVMAT activities, the fleets and other components of the navy is provided by the Radiological Affairs Support Office at the Naval Nuclear Power Unit, U. S. Army Engineer

Center, Box 96, Fort Belvoir, Va.

The hazards associated with radioactive materials and equipment producing ionizing radiation require utmost care for the protection of the general public and naval operating personnel against inadvertent exposure to these sources.

The support available from the Radiological Affairs Support Office covers all aspects of ionizing radiation from x-ray devices, accelerators, radiographic units; and from both licensed and non-licensed materials, including radioactive waste regardless of origin except that from nuclear propulsion systems or their prototypes.

Uninterruptible Power Systems

By JOHN A. RODGERS
Electrical Communications
• Alexandria, Va.

The present state of communications equipment frequently depends on power line frequency for synchronization of the equipment from point to point. This, of course, means the equipment must be on the same power source. Many of the computers in use in the navy today also depend on a completely reliable power source so as not to erase or change the memory banks.

Even so much as a voltage transient or an interruption of part of a cycle of power could unsynchronize equipment or alter the memory of a computer.

The navy's latest approach to this problem is the static uninterruptible power system (UPS). This system consists of four main components. These are:

• the rectifier, to convert AC power to DC power,

• the battery banks, to provide an alternate source of DC,

• the converter, which converts DC power to 60 Hz AC power

• and finally an emergency generator to take care of a complete power line outage.

The converter can be described as a power oscillator which converts the DC power input to a 60 Hz power output. It is this output which feeds the critical technical load of communications equipment or the computers. The input to the converter is the DC output from the rectifier, or the battery banks in case of failure of the rectifier or the line voltage. Since the critical load depends only on the 60 Hz generated by the converter, the equipment never "sees" a failure of the rectifier or the line voltage.

The batteries are in a "float" condition so that the output or the rectifier keeps them charged at all times. In the event the rectifier fails, the batteries automatically feed the converter so that the output of the converter does not have an interruption. The batteries have a limited capacity, (generally five to sixty minutes) delivering full load. During this period, the emergency generator automatically starts, restoring AC power to the input of the rectifier. The output of the rectifier then takes over feed of the converter and the batteries are put back on charge.

Uninterruptible power systems are also redundant, in that if a rectifier or converter fails completely, a second component comes on line.

In using these uninterruptible power systems, it is especially important that non-critical equipment is not connected to the critical circuit. If, for example a fan were used on this critical bus and caused a transient, the uninterruptible power system would not be able to suppress the transient.

The Commander, Naval Facilities Engineering Command, is responsible for the design, procurement and installation of uninterruptible power system. Within NAVFAC, the operational facilities construction division, (Code 051), is responsible for the overall program management.

The Chesapeake division has been designated by the NAVFAC commander, as technical manager for uninterruptible power systems for the navy.

To date a total of eighteen static uninterruptible power supplies have been procured. In addition, present plans call for future procurement of several additional uninterruptible power systems.

Energy Resources Group Established

By W. C. C. JOHNSON
Public Affairs Office
• Alexandria, Va.

There is a growing realization that limits exist in the availability of various energy resources throughout the country and that these limits need to be understood and plans made to account for their impact upon the Naval shore establishment.

Recognizing that there are constraints in the availability of energy resources, the Naval Facilities Engineering Command has established an Energy Resources Group (what better acronym than ERG to focus attention on energy?) and has appointed Cdr. George M. Gans, Jr., CEC, USN, as its chairman.

The mission of this group is to examine the impact of limited energy resources upon the naval shore establishment and to recommend courses of action to be taken by the command.

ERG is charged with: identifying the nature of limits on energy resources which effect the shore establishment of the Navy; recognizing the impact of such limits upon the shore establishment and its fleet support responsibilities; appreciating existing policies, actions and programs which relate significantly to the use of energy; and recommending appropriate policies and actions to be pursued by the Naval Facilities Engineering Command or higher authority.

During the tenure of the group, it is further responsible in coordinating new initiatives and special studies related to energy matters. The group will not be involved with the execution of energy related operational programs assigned to the various components of the Naval Facilities Engineering Command. However, it will keep itself advised of the progress of such programs in order to better carry out its functions of taking a broad view of energy matters.

Vehicle Storage Facility Opens

• Alexandria, Va.

The Navy's first vehicle storage facility designed for deployed fleet personnel was opened officially on January 17, 1973 at the U. S. Naval Station, Charleston. S. C.

The building was first planned before CBU-412 was established in 1970 and it required about a year for completion, including site preparation. Effort involved expenditure of 1,460 man-days by Self-Helpers and 820 man-days by the Seabees. The work required all rates of the Seabees and the total cost of the facility was approximately $64,000.

The building's six sections will accommodate 144 motorized vehicles. A masonry fireway separates each section. Corrugated metal siding and roofing was applied to a wood structure.

Operation of the facility is a function of the Navy Exchange Service Station at the Naval Station, Charleston, South Carolina.

Officer-In-Charge of CBU-412 is LTJG Bernard Murphy, CEC, USN. Builder First Class T. W. Howell was the Self-Help crew leader.

PacDiv Goes on FACSO Teleprocessing Line

By CDR. J. T. BURTON, CEC, USN
Head FACSO

• Port Hueneme, Calif.

The Pacific division is now joining the five other engineering field divisions in teleprocessing management information system applications at the Facilities Systems Office (FACSO), here.

A remote job entry (RJE) terminal will be installed at PACDIV in July/August enabling on-line batch processing through FACSO's IBM 360/65 computer.

Future plans call for RJE's at the continental EFD's, plus CBC Davisville, and CBC Gulfport, to replace the present off-line tape-to-tape system.

Since 1971, the continental activities have been provided ADP support via the NAVFAC dedicated telecommunication network utilizing tape controllers to input data and to receive output reports.

All activities have print capability to produce hard copy from the tapes. This off-line system requires human intervention at several steps, is relatively slow, and therefore, costly.

Until February of this year, PACDIV and OICC's MIDPAC / Guam / SOWESPAC / Thailand / Yokusuka were served by mail from the Bangkok Computer Center. Due to the elimination of work for RVN and increased computer capability at FACSO, the Pacific Ocean Area workload was transferred to FACSO. PACDIV and its OICC's are now supported by mail and air freight from Port Hueneme. As a result, the Bangkok Computer Center was transferred to the State Department.

The stumbling block to teleprocessing for PACDIV has been the data link required and the high line cost across the Pacific. An agreement was recently consummated with the Navy Astronautics Group, Point Mugu, California, to share their telecommunication line from Point Mugu to Wahiawa, Hawaii. Connecting branch lines will be installed from Point Mugu to FACSO and from Wahiawa to PACDIV. Line sharing is cost effective; providing access to Hawaii that would otherwise be prohibitive.

The remote batch terminal system installed at FACSO on 21 May 1973. The prototype configuration, consisting of a 300 card per minute reader and a 400 line per minute printer, passed extensive acceptance tests prior to shipment to PACDIV on 1 July 1973. This equipment extends the power and speed of a large-scale computer system to remote locations over dedicated or dial-up lines for the batch processing of their individual data processing requirements.

Since the off-line system was installed in CONUS, the ADP equipment industry has made great strides in development of on-line batch terminals. RJE's are now available that will out perform the off-line system at less cost. PACDIV will be a prototype installation for NAVFAC utilizing a 300 card per minute reader and a 400 line per minute printer. The equipment is being tested at FACSO at this writing and will be operational at PACDIV in August. The RJE's will serve as data input terminals and on-line printers to receive standard routine reports, utilizing the EFD data base at FACSO. Additionally, RJE's can provide the activities the capabilities of a large, fast, powerful computer for on-line processing of programs when the card deck contains all elements—job control, application

This installation extends FACSO's computer into the programs, input data, etc.
Pacific and decreases turnaround time for PACDIV and OICC MIDPAC. Future RJE's in CONUS will improve turnaround time, increase the flexibility, and decrease labor costs at the EFD's and CBC's. The existing CONUS telecommunication network will be utilized and equipment costs will go down — "more ADP bang for the buck".

SouDiv Nets Navy's Largest Timber Sale

By TRAYNOR FERILLO
Public Affairs Officer, SOUDIV

• Charleston, S.C.

The Southern Division, Naval Facilities Engineering Command, has recently made its largest sale of Navy timber when it accepted a bid of $207,934 from a Summerville, S. C. lumber company. The sale involves the thinning of trees on some 335 acres at the Naval Weapons Station, Charleston.

Trees harvested will provide pulpwood for paper products, sawtimber for lumber and large logs for veneer.

Before the Navy-wide forestry program was initiated in 1961, the total income from the sale of timber in the Sixth Naval District was only $3,600. Since then, rapid strides have been made in improving the program under professional management provided by foresters in the Southern Division's Natural Resources Management Branch.

Some 45,000 acres of forests are now producing a continuous supply of forest products for industries near military activities throughout the seven states of the Sixth Naval District. Navy timber sale revenue has increased gradually each year. In 1973 it will amount to more than $150,000 in actual cash received.

Timber sales have amounted to approximately $1 million since 1961 and this money is used to sustain forestry programs on a Navy-wide basis.

A Navy spokesman said that forestry is taking on added significance at Naval activities and this is chiefly the result of professional management of forestry programs.

Every spare acre of land is being planted, not only to grow timber, but also to reduce grounds maintenance expense at the activities where programs are in effect.

For example, the efforts of forestry personnel at just two of these Naval activities, where the planting of improved areas is to be done this winter, will result in a recurring savings to the Government of approximately $35,000 a year.

Gambusia vice DDT Quells Culex Mosquitos . . . ask your Entomologist

By TERENCE COOPER

Natural Resources Mgr. CHESDIV

• Alexandria, Va.

The *Gambusia* is a fish of small size native to Southeastern United States from Delaware and Maryland to Texas and along the Mississippi River to Illinois.

The usefulness of this fish for control of mosquito populations has been recognized since about 1890. Interest died during World War II due to the development of DDT and other chemical insecticides. Interest was revived about 1960 along with the awareness of the possible long term harmful effects of persistent chemicals on our environment.

Gambusia bear their young alive so that no special substrate conditions are required as in egg layers. Their tolerance to high temperature, turbidity, pollution (non-acidic), low oxygen levels and other normally adverse conditions makes them ideally suited for use in mosquito control. They can survive almost anyplace mosquito larvae can survive.

This fish is easily trapped, transported and stocked. Relatively small populations can rapidly increase to levels which will maintain control over the mosquito populations.

Research is inconclusive with respect to the possible influence *Gambusia* may have on game fish populations. This lack of information gives rise to the recommendations that this fish not be stocked in waters having desirable endemic fish populations.

In combination with proper use of insecticides and larvicides *Gambusia* have given good control of some species of mosquitos.

Gambusia affinis, while showing some good potential for biological mosquito control has definite limitations. If the major problem is with mosquitos other than *Culex,* such as salt marsh, then this fish would be of little value. The use of these fish could be detrimental if not used in a conscientious manner, or can fail if the biology of the fish is not understood.

In order to avoid the misuse of this fish which could cause further problems with conservationists any activity desiring to use *Gambusia affinis* in their insect vector program should first contact the Entomologist and fish and wildlife representatives at their EFD's for assistance and guidance.

Livestock Grazing on Navy's Boardman Bombing Range

By DONALD C. RAPPEL *Staff Forester, WESDIV*

• San Bruno, Calif.

The Navy's Boardman Bombing Range is located in north central Oregon along the Columbia River. At first glance, this area of the state appears to be an inhospitable desert, but to local ranchers, the bombing range is one of the few good winter grazing areas for cattle.

In the winter the snow forces the cattle out of the mountain grazing areas and winter ranges are in short supply, thus the interest in the Boardman range.

The history of the bombing range, prior to Navy ownership, is characterized by serious over-grazing which causes perennial grasses to die and annual-growing grasses to replace them. Consequently, sagebrush takes over large sections of land when the perennial grasses are killed by the over-grazing.

The annual grass produces an amount of forage which varies according to temperature and moisture and die each year with the dry grass creating a serious fire hazard on the range. Spotting charges in the practice bombs contain a shotgun-shell type charge which can cause grass fires and threaten nearby wheat lands. In this remote area, until the fire is detected and brought under control, huge grass and crop areas could be destroyed.

To reduce the fire hazard, the Navy outleases all areas of the range outside the target area. The Western Division, Naval Facilities Engineering Command, San Bruno, Calif., outleases more than 23,240 acres which produce income of $10,650 per year.

The leased areas of the range are periodically inspected to insure that the over-grazing practices of years past are not repeated. The inspection also permits the proper placement of water holes and salt-licks to insure utilization by livestock.

In the future, the lessees will be required to perform conservation work on the range as a credit against rental due the government. This work involves removal of sagebrush, reseeding the range, construction of temporary fencing for deferred grazing and development of new water sources.

At present, lessees are grazing 400 cattle and 2,000 sheep. After the development of the range, through the longe-range conservation plan, the Navy hopes that the forage produced will double, thereby allowing the lessee to graze twice as many animals and resulting in twice the amount of rental now being paid.

The long-range conservation plan will produce perennial grasses and will become a stable producer of forage which will pay dividends by reducing maintenance costs and fire hazards as well as contribute to the local economy.

Grass is an important natural resource, the same as timber, wildlife and fish, which must be renewed and managed for the benefit of all. In this way, the Navy hopes to fulfill its responsibilities in the management and control of the resources under its jurisdiction.

NAVFAC Cost-Cutters Sheepish

By ROGER O'DONOGHUE

• Alexandria, Va.

NAVFAC's real estate people try hard to manage navy property efficiently, both to save scarce O&M dollars and to bring revenue to the U.S. treasury. Occasionally the crystal ball doesn't disclose all the pitfalls.

The Casco Fuel Farm, serving Naval Air Station, Brunswick, Maine, occupies about 115 acres of land. Fuel tanks are well spread out for safety reasons, leaving large areas of grassland. To minimize fire hazards and for esthetic reasons the grass had to be cut at an annual cost of about $2,000. The obvious way to economize was to find someone else to do the work.

A little advertising disclosed that a local farmer was willing to pay $126.00 a year for the privilege of cutting the grass. In 1970 a grazing lease was duly entered into with the farmer and 300 sheep came aboard. The sheeps' devotion to duty was unquestioned. They performed an excellent job in keeping the grass cut and no doubt helped to fertilize the land as well. Unfortunately, unforeseen circumstances required the cancellation of the lease.

It seems that Maine nights are rather chilly even when wearing a genuine 100% wool coat, and though sheep are not too bright they gradually became aware that the warmest spot in the area was in the immediate vicinity of the fire station. Consequently, there was a nightly congregation of 300 sheep at the fire station making it all but impossible for the firemen or equipment to get in or out. It was also being reported that counting sheep did not help the firemen get to sleep.

Not at a loss for a solution, NAVFAC directed that the sheep be honorably discharged. You just can't win them all.

MODULAR BEQs AT REINDEER STATION

Aerial view of cantonment area in January 1973 shows sequential construction: built-up roof application on first wing; quick beams set and roof forming on last section of second wing. BEQs No. 1 and No. 2 show CMU effort, while grade beams are formed on BEQ No. 4.

By LT GEORGE W. YANKOUPE, CEC, USN

Project Manager, NMCB-62

• Diego Garcia

Previous issues of the *NAVY CIVIL ENGINEER* have referred to the modularization of bachelor enlisted quarters (BEQ) and its construction implementations at numerous Naval facilities. This modular concept has now been incorporated into the design of the permanent cantonment area of Reindeer Station, Diego Garcia, British Indian Ocean Territory, where four of five modular barracks are currently under construction by Seabee Battalions.

BEQ No. 1 is a one story "L" shaped reinforced steel and concrete masonry unit structure, physically dimensioned in two segments. The first wing runs 226 feet parallel to the plane of the lagoon in a northeasterly-northwesterly direction and the second, wing of 238 feet, perpendicular to the lagoon in a southeasterly-northwesterly direction.

The wings are physically separated between columns by a one inch division, maintained from a common footer up through the 14-inch columns of column lines, the 8-inch CMU (concrete block) bearing walls and finally the two 8-inch roof curbs that terminate each thirty-six foot wide wing.

The structure occupies nearly half an acre of the plan-projected area and provides approximately 16,500 sq. ft. of living area which is composed of nine five-room modules and one core area. The typical module provides 1,650 sq. ft. proportioned into one common lounge area surrounded by four 3-man bedrooms. Two adjacent bedrooms share one bath through a private entrance.

A five foot sidewalk, sheltered by a five foot roof overhang, runs the entire length of the "L's" inner facet, servicing the entrance to each module. The arrangement obviates the need for an interior corridor, increasing the living square footage accordingly.

The structural characteristics of Barracks #1, the largest, are representative of the remaining four, which differ only in orientation and dimension. Barracks #2 and #4 are identical five-module structures, 231 by 36 feet; Barracks #3, 277 by 36 feet, contains five modules and a core area; Barracks #5, 323 by 36 feet (designated the CPO quarters) contains a core area and six modules with each bedroom having a private toilet instead of the semi-private facilities of Barracks 1 through 4.

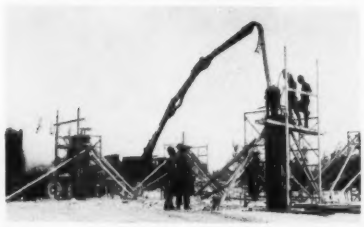
The individual module, designed toward a domesticated atmosphere, is physically dimensioned as: four 15½ by 17 foot three man bedrooms surrounding a centrally located 13½ by 17 foot living room. Each bedroom adjoins the living room and has a private entrance to a shared bedroom which includes two lavoratories, one partitioned toilet and one combination shower/drying area.

The shower is constructed with 6-inch partition walls covered with ceramic tile, a plaster ceiling, and a mosaic tile deck. The bath area external to the shower is wainscoated with ceramic tile, has a mosaic deck and a suspended acoustic ceiling with a central exhaust fan.

Each bedroom and the living room has painted block walls, a vinyl tile deck and a suspended acoustic tile ceiling; all are air conditioned with individual fan coil units supplied by a master chilled water system. The acoustic tile ceiling is installed with a 14 inch vertical face, rising from 7' 2" below the fan coil unit to 8' 4" to accommodate the air condition duct grille. Additionally, each bedroom has a two-piece sliding screened 6' x 4' 8" window and the living room, a 4' 8" square window.

The core area, divided by a central six-foot corridor providing through access, features a 30 x 17 foot lounge, a 9 x 17 laundry area, a 26 x 10½ foot double-compartmented baggage storage area and an 8 x 10½ mechanical room. The mechanical room is completely unfinished, and houses the 680 gallon water heater as well as various telephone and electrical panel boxes.

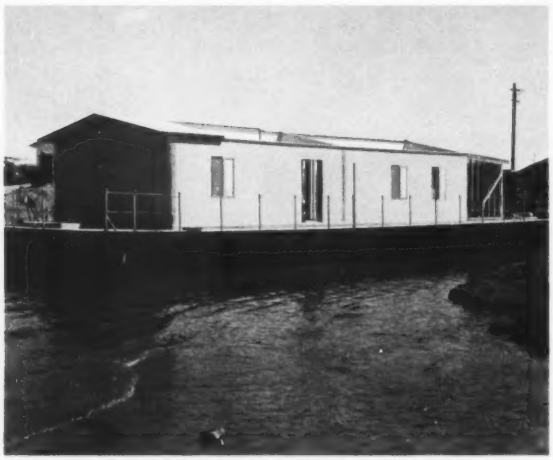
Staggered construction start dates for Barracks 1, 2, 3 and 5 have generated a sequential construction system: finish and trim effort continues from module 1 to 9 on BEQ #1; roof forming and pouring from module 1 to 5 on BEQ #2; exterior and interior CMU bearing walls from module 1 to 6 on BEQ #3; and footing, grade beam, column and deck slab from module 1 to 7 on BEQ 5. The compacted coral pad of BEQ 4, the last of the barracks to be constructed, provides a temporary central material storage area.



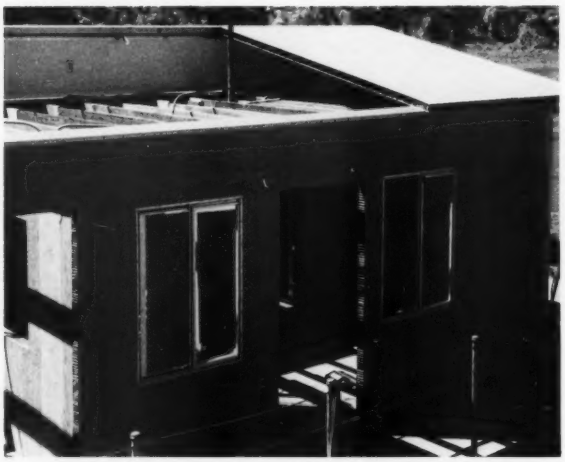
The first of BEQ No. 1's 45 columns is poured, employing concrete pump.

Forming grade beams for BEQ No. 1. Note cement silos in background.

Seabees Build Floating Hospital in Bolivia



The nearly complete hospital barge sits quietly on the shores of Lake Titicaca.



Prefabricated Lewis building on the AMMI Pontoon will house the offices and patients that will occupy the hospital barge.

• Gulfport, Miss.

When Seabee Team 7412 deployed to the Lake Titicaca region of Bolivia in June 1972 it experienced several novel operations; being the first Seabees to professionally visit Bolivia, the first remote field construction of an AMMI Pontoon, and the first sustained operation at an altitude exceeding 13,000 feet. Along with these other precedents, 7412 also established a new concept of Seabee Team operations. The new concept was that it deployed with a specific construction task of assembling a 90' x 28' floating hospital, vice the self-help training programs previously undertaken by Seabee Teams in Vietnam and the Trust Territories of the Pacific Islands.

Although the team did utilize Bolivian sailors as construction assistants and trainees, the training aspect took second priority behind completion of the much needed civic action project. The project itself was sponsored jointly by the United States and Bolivian navies and funded in part by United States Aid In Development (USAID) in Bolivia. The team was tasked with field construction and launch of an AMMI Pontoon, erection of a prefabricated Lewis building on the pontoon, installation of auxiliary equipment to outfit the hospital barge, and training the Bolivian Navy to maintain and operate the barge. The barge is designed to provide medical assistance to some 200,000 Aymara Indians who inhabit the shores of Lake Titicaca.

In preparing for the three month deployment, the team did not undergo the normal Seabee Team training or follow the normal team selection criteria. Instead, team members were selected for their construction skills and the only non-technical training consisted of one week of human relations training. The team was composed of a Lieutenant (junior grade) as Officer-in-Charge and a Chief Petty Officer (Steel Worker SWC) as Assistant Officer-in-Charge, three BUs, six SWs, two EOs, one CM, two UTs, one HM, and two augment enginemen from Amphibious Construction Battalion TWO.

All reports indicate that the project was a complete success with the barge now in operation by the Bolivian Navy since January 1973. The door should be open for other Seabee civic action and self-help teams to re-enter South America, and other teams to be formed under this new concept.

The AMMI Pontoon lies in waiting for the Lewis building to be constructed on it.

The tents and minimum of supplies provided for Seabee Team 7412 during its stay in Bolivia at 13,000 feet above sea level.

Seabee Reserves

Mobile Reservists Build Hobby Shop in Self-Help Project

• Mobile, Ala.

Detachment 6-23 of RMCB 14 in Mobile, recently devoted several drill weekends in a self-help project constructing a complete hobby shop for military personnel of the Naval Systems Laboratory Command, Panama City, Fla.

About 85% of the detachment personnel labored more than 15 man-hours a day for over six weekends, during which they cleared ground, put down a foundation and erected a 40x80 foot Mitchell-type metal building complete with plumbing and electrical facilities. The shop includes carpentry and automotive workshops, office and storage space, a tool room and rest rooms. Around 85 to 100 military personnel will use the shop.

LCdr. Ted Mathis, training officer for Detachment 6-23 at the time, arranged the project. On-the-job superintendent was Chief Builder C. W. Patterson, who was on site

most of the time and helped in the actual construction. Chief Utilitiesman W. E. Tucker served as on-the-job petty officer and record keeper.

The detachment has also undertaken a community center building at Stapleton, Ala. and a pier and dining hall structure for a girl scout camp at Citronelle, Ala. Each Christmas they give a party for retarded children at the Pritchard Armory in Pritchard, Ala.

Lt. D. M. Edington, commanding officer of Detachment 6-23 commended the detachment for its "dedication, enthusiasm and determination . . . in a self-help project that not only helps the community but the individual and collective pride of the detachment."

Seabee Reserve Command Changes

RAdm. Reider (left) passes his flag to Lt. Fred Bankert (right) flag lieutenant and aide, for relay to RAdm. King (rear) during change of command ceremonies.

• Port Hueneme, Calif.

Three Naval Reserve commands shifted hands during ceremonies at the Port Hueneme Naval Construction Battalion Center, June 30.

RAdm. Philip V. King, CEC, USNR, assumed command of the First Reserve Naval Construction Brigade from RAdm. George Reider, CEC, USNR. RAdm. Reider has retired.

RAdm. King had earlier relinquished command of the First Reserve Naval Construction Regiment to Capt. John Nutter, CEC, USNR.

Command of the 17th Reserve Naval Mobile Construction Battalion was passed from Cdr. A. H. Martin, CEC, USNR, to Cdr. Roger W. Muir, CEC, USNR.

Among the military dignitaries on hand for the ceremonies were: VAdm. Damon Cooper, Chief, Naval Reserve Command; RAdm. A. R. Marschall, Commander Naval Facilities Engineering Command; RAdm. J. R. Fisher, Commander, Construction Force, Pacific; and RAdm. W. M. Harnish, Commander, Pacific Missile Range.

Professional Development

HOW TO BRIEF . . . BRIEFLY

By LCDR ALLEN BOOTHE

Every briefer sets out to give his audience a clear understanding of who, what, where, when, and how. When he is finished, he inevitably gets some questions (or else his audience is asleep), and these questions tend to group in certain areas, and *can* be anticipated. They usually result from the briefer being *too* knowledgeable and familiar with his subject. Here are some distilled lessons I have learned the hard way:

• The most common and most consistently fatal flaw in giving briefings is the sin of failing to consciously consider your subject matter *through the eyes of the person you are briefing.* What previous exposure has he had; what is his record on similar subjects; what is his pre-disposition toward you and the organization you represent? Will his experience cause him to reinforce the conclusions you will present? Think this out *in advance!*

• Back away from your subject and be objective. Where does your subject fit in the broader scheme of things — how does it relate to national policy — or DOD policy — or Navy policy? What are the gross parameters which allow the audience to quickly understand the order of magnitude of your subject and the conclusions you will present. Ask your wife what terms she thinks of when considering your subject matter, and you may avoid your own *unconscious* use of terms with which you are comfortable, but which will antagonize rather than win the support of your audience due to their unfamiliarity. Once you have these macro-parameters, be specific in defining the size of the *change* that would be wrought by the implementation of your recommendations or conclusions.

• Organize your briefing logically. You can build it around a chronological skeleton; you can move consistently from the more general toward the specific; you can follow any logical sequence of events, but be sure it is *logical.*

Each point must lead to another until your point is made and your briefing concluded.

• Structure your briefing to last no more than 1/2 to 2/3 of the time allotted to you. Surprise your audience by making your point and finishing *early*. Make sure every point you make contributes to your conclusion — if it is not necessary for the conclusion, drop it — no matter how interesting it may be to you. There is no subject so complex that it can't be presented in 20 minutes.

• Don't, under any circumstances, talk down to your audience. Overestimate their background and general level of intelligence to be safe. Remember that you wouldn't be giving the briefing if the persons you are talking to weren't in positions of power and responsibility that have been earned over years of experience in positions of responsibility.

• Practice *does* make perfect; dry run your briefing *formally* at least *once*. Above all, don't memorize!

• Be sure to tell your audience *what you want them to do*. Don't let them guess! You can rest assured that they are wondering, early in your briefing, what they should do with the information you are giving. Figure out what your audience wants to get out of your briefing, and *give it to them*.

• When it comes to making arrangements for graphic support, projectors, etc. — Don't trust anybody but yourself. Take all the spare bulbs, equipment, extension cords, shims for the projector, pointers, etc., that you might need. Better to carry too much than come up short at a critical time.

Okay. Your preparation is complete. Let's make a last minute check — those 10 questions:

1. How does this fit in with broad goals?
2. What is the overall change being proposed — in gross terms?
3. What is the total cost of this proposal (i.e., all funding sources)? What is the unit cost per square foot (or per man or whatever)?
4. What alternatives were considered but rejected? Why?
5. Who has the authority to approve this course of action?
6. How will others view this proposal?
7. How have others already responded to this proposal?
8. What happens next?
9. What do you want *us* to do?
10. What happens if we don't buy your proposal?

Good luck.

Co-op Administrative Work-Study Program

By LOUISE LEWIS
Equal Employment Opportunity Coordinator
• Alexandria, Va.

In fiscal year 1973, NAVFAC established a limited work-study program which permitted headquarters and field activities to employ college students who were interested in careers in engineering or administration. In Fiscal Year 1974, NAVFAC and its field activities will be able to have a greatly expanded program through participation in a Navy-wide work-study program that has been described as the most ambitious program of its type.

Salaries of participants will be funded by the Office of Civilian Manpower Management (OCMM) and activities are authorized to carry enrolled personnel in excess of any assigned employment target or end strength limitation.

The Secretary of the Navy has established a cooperative education program for the civilian administrative occupations in the Department of the Navy. The coverage of the program includes administrative positions such as procurement, financial management, accounting, transportation and data processing.

Students assigned to administrative occupations under the NAVFAC program will be picked up under the Navy-wide plan in fiscal year 1974. As engineers and architects are not included in the Navy-wide plan they will continue to be carried under the NAVFAC program. Ceiling and funds previously utilized for administrative positions will now be used to recruit students majoring in architecture or engineering.

Under the Navy-wide plan for administrative positions, funds have been programmed for 570 students in fiscal year 1974. NAVFAC and its field activities will have a total of 22 of these co-op students. Twenty will be disbursed among 7 field activities. An additional 570 students is planned by Navy for fiscal years 75 and 76 respectively.

Under the command funded co-op program for engineers and architects, activities will be contacted in regard to placement opportunities based on availability of students and their interest in specific geographic locations.

There are several reasons for embarking on this effort. Among them is included the need to insure a planned intake of college graduate trainees to offset the large number of anticipated retirements in the next five years in occupations such as procurement, supply, financial management, budget, personnel, etc.

The program can also help the Navy in its efforts toward full integration of the work force by assuring an improved mix of minority group members and women in the trainee input population. Also, by participating with local educational institutions in cooperative work-study education programs, the Navy becomes a partner in the education process and further provides tangible evidence of its interest and participation in advancing national social objectives.

Cooperative education is a program that provides opportunities for under-graduate students at accredited colleges or universities to alternate periods of academic study with periods of study related employment with the Navy. The Navy looks upon the student's work experience as an important component of his total college experience, and the college takes responsibility for making the job an integral part of the curriculum. The program is conducted in line with a working agreement between the Navy and the college in accordance with Civil Service Commission regulations. The design and schedule for cooperative education varies greatly among colleges. Rotation is generally on a quarterly, trimester, or semester basis and work is on a full-time basis during that period rather than intermittent, or a daily or weekly part-time basis.

The co-op students participating in the Navy program will normally have completed their freshman or sophomore year and have achieved at least a "C" average. They will be hired under excepted appointments at the GS-3 or GS-4 level. Upon successful completion of the work study program, which generally provides for a minimum of 36 weeks of work and two or more work periods, students can be placed into a centrally managed trainee program such as the NAVFAC Professional Development Center, personnel, supply, financial management, etc., or in a similar career trainee position in a field activity.

Activities to which students are assigned will be responsible for the success of the program by providing meaningful training assignments and evaluations of the student's

progress. The supervisors play a prime role in affording the student with a practical exposure to the world of work and, in a sense, become partners with the educational institution in the educative process. The staff who are to provide immediate supervision to cooperative education students should be carefully selected. Besides being competent in their fields, they should have the ability to delegate purposeful tasks, to promote career development, to relate theory to practice, and to help students adjust to new environmental conditions of work and living.

Ens. Rigoulot Graduates From CECOS

. . . school's first alumna

By Chief Journalist TOM CHANCE

• Port Hueneme, Calif.

On April 27, Ensign Jeri Rigoulot became the first woman to graduate from the Navy's Civil Engineer Corps Officers School (CECOS). During the 106-year history of the CEC, only two other women have served in its ranks; neither underwent training at the Port Hueneme school.

"The Corps will never be the same," said Capt. E. M. Saunders, commanding officer of the Naval Civil Engineering Laboratory. The Captain, who is one of the Navy CEC officers holding a doctorate degree, was principal speaker for CECOS graduating class 129. "I mean that as a compliment," he quickly added. "Jeri has insisted on being put into one of the 'working billets' just like one of the boys, and we're very proud of her."

Ensign Rigoulot, who requested a challenging job, will report to the Public Works Center on Guam in June.

"I enjoy responsibilities and opportunities to work at my profession," she said. "That's why I asked for this type of duty; it should be quite rewarding."

Although she calls herself "a flaming women's libber," Ensign Rigoulot says that when she joined the Navy she had no idea that she would end up being "a first anything." As long as I'm competent at my job," she says, "then I'll be content. I'm not trying to blaze any trails."

The ensign is certainly no novice to either the Navy or to architecture. Born 26 years ago, Miss Rigoulot has followed in the footsteps of her father, Louis R. Rigoulot, Jr., who is an electrical engineer.

After attending Clemson University for 2½ years, the urge to travel had her packing suitcases for a job in Europe. She worked for the U. S. Embassy in Paris for several months, and then moved on to London where she was employed by an architectural firm.

Later, she returned to the U. S. and obtained her bachelor of architecture degree from the University of Virginia. After graduation she got a job with another architectural firm in Georgetown, a suburb of Washington, D. C.

"There were several former Navy CEC officers working there," says Ensign Rigoulot. "When I started getting the travel urge again, they suggested that I try the Navy."

Her father, who was once an employee of the Navy's Bureau of Yards and Docks, cautioned her, "Don't go in until you get those crossed bananas!" ("Crossed bananas" is a slang term used by CEC officers to describe the insignia which represents their corps.)

When she went to see the Navy recruiter, she was told that there were no billets open in the CEC to females. Never easily discouraged, she contacted an aquaintance in Washington, D. C., who told her that Admiral E. R. Zumwalt, Jr., the Navy's Chief of Naval Operations, would soon issue a directive opening many billets which were formerly restricted from females. Shortly thereafter, Z-Gram 116 was distributed and Ensign Rigoulot became the first woman to enter the Civil Engineer Corps since 1944.

In 1942, Ensign Kathleen Lux of Logansport, Ind., became the first woman to join the CEC. Before being separated from the service at the end of WWII, she had been promoted to Lieutenant.

LCdr Gertrude Sawyer of Tuscola, Ill., entered the Navy in 1943 and was appointed an officer in the CEC in 1944. Although neither woman made the Navy a career, LCdr Sawyer remained in the Naval Reserve.

When asked about her military future, Ensign Rigoulot said, "It's a little early to tell if I want to make the Navy a career. I'll have to see how things work out."

Research and Development

UNDERSEA CENTER STUDIES NOISE

By E. R. SUTTON

Naval Undersea Center

• San Diego, Calif.

A new noise study is being conducted by Naval Undersea Center (NUC) scientists here for a civilian agency to establish acceptable impulse-impact noise levels for industry.

The study is being directed by Robert S. Gales, head of NUC's acoustics, behavior and communications group and by Dr. Roy G. Klumpp, head of NUC's auditory detection and communications division.

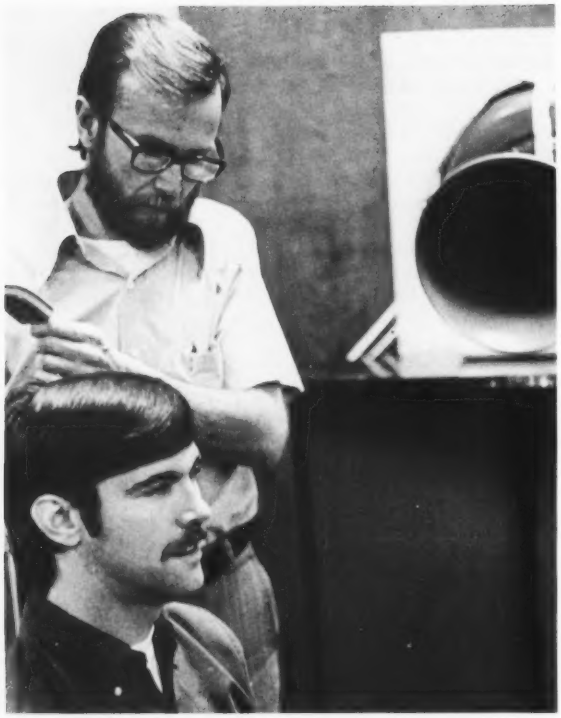
An agreement has been made between the National Institute for Occupational Safety and Health (NIOSH) and NUC to develop suitable field measuring equipment and techniques and to perform laboratory and field measurements of impulse-impact noises.

NIOSH is a civilian agency of HEW, the Department of Health, Education and Welfare.

Impact noises are caused by heavy industrial machinery such as punch presses and by the banging of hammers against metal or the dropping of sheet metal on concrete floors.

The objective of the agreement is to obtain data which will aid in developing criteria for a health standard to prevent hearing damage from impact noise. Standards have already been set on steady state noises as occur in engine rooms and assembly lines; and on military type noises such as gunfire. Very little research has been done on impact noises which are in-between these two types of noises.

By law ears must be protected from steady noises over 90 decibels (db) when exposure is in excess of eight hours daily. Impact noises have high peak sound pressure levels, often above 140 db, but lasting for only a fraction of a second. No one knows what the limits of impact noise



really should be.

What happens to hearing during periods of prolonged exposure to impact noises is one of the questions NUC researchers are trying to answer. A punch press might make 30 bangs a day, all over 90 dB, but this is not necessarily bad for hearing.

The specific questions to be answered are:

1. What parameter(s) can best be used to predict hearing damage from exposure to impact noise, e.g., is peak sound pressure level a better predictor than total sound energy exposure?
2. What is the relationship between the parameter(s) and the degree of hearing impairment?
3. Can a simple instrumentation package and measurement technique be developed to allow industry and government inspectors to assess the risk of hearing damage due to impact noise?
4. What is a safe level of exposure to impact noise?
5. What types of manufacturing-construction equipment and processes generate harmful impact noise?

To find the answers to these questions, NUC researchers have conducted a comprehensive survey of foreign and domestic literature, including texts, journals, reports, standards and advertisements related to impact noise.

In addition, NUC investigated the feasibility of reliably generating "controlled" impact noises in the laboratory to determine whether electronic/electrical or mechanical means could be found to generate sounds for temporary threshold shift (TTS) testing.

Although the researchers found these sounds hard to simulate and to record, they have managed to identify and record 18 of them. Some sounds were then simulated and recorded in the laboratory while others were taped as they happened in a sheet metal shop and a shock and vibration shop.

While these sounds were being recorded, the researchers tested the ability of "impact" noise meters to determine the extent to which they could accurately characterize the noise signal, e.g., peak, duration, waveform, etc.

With the knowledge gained from the literature survey and previous experiments conducted by NUC, the scientists expect to begin laboratory TTS testing of human listeners soon. Tape recorded impact noises will be played back to listeners in an isolated audiometric booth.

Hearing thresholds will be constantly measured to be sure listeners are not exposed to too much sound during the experiments. This will include screening the hearing of the listeners before and after exposure to the sounds.

Dr. Klumpp and his associates, Dave Schmidt, Jack Hoke and John Leonard, will begin the TTS phase of the program by using themselves as listeners. Area college students have volunteered to serve as listeners for the final phase of the study.

The reason for constantly measuring temporary threshold shifts was related by Dr. Klumpp, "Sounds can harm or affect people. We even find ourselves getting fatigued as we work with noise, so we treat people with a great deal of caution to assure that TTS is just that, temporary."

The Naval Hospital, San Diego, will provide medical supervision for TTS tests. This will involve initial screening of all experimental subjects and supervision of medical aspects of the program by the hospital's chief of otolaryngology.

The TTS phase was completed by June 30, 1973, to be followed by a lengthy evaluation of audiometric data collected during the experiments with listeners to enable NUC researchers to report reliable findings from the overall study.

"Although this noise study is being carried out to establish safe civilian health standards," Dr. Klumpp concluded, "it will be a two-way street. The Navy has its own industrial shops and similar noise problems aboard its ships, so the study will be of direct benefit to the Navy, too."

Non-Destructive Pavement Tester Trials

By MICHAEL P. JONES
Civil Engineering Specialist, HQNAVFAC
• Alexandria, Va.

Since 1963 NAVFAC has been conducting a program for evaluating the load carrying capacity of airfield pavements at naval and marine corps air stations. Load ratings have been established and reports are available for all major air stations in the continental United States and abroad. These data are published in NAVFAC P-18, "Pavement Evaluation Data for Naval and Marine Corps Air Stations".

Load ratings are obtained through the use of conventional destructive type field tests and generally accepted design theories. Field testing consists of cutting beams and cores from concrete pavements, sampling subsurface materials and testing them in the laboratory, and performing loading tests on asphalt pavements.

In an effort to improve on methods for obtaining pavement load ratings NAVFAC Code 0415 is investigating a non-destructive pavement testing device capable of applying a dynamic load to the pavement at varying frequencies and measuring the deflection at two locations. It can provide measurements rapidly and cover a wide pavement area in a short time. Much work is needed, however, in translating the deflection data to a set of load capacity ratings for the pavement area.

SouthDiv is conducting the field studies under the engineering investigation program. Work has been completed at NAS Chase Field and will continue at NAS Memphis.

NAVFAC Sets Discrete Carpet Flammability Standards

By GEORGE E. BAER
Furniture Specifications
• Alexandria, Va.

No facet of the carpeting industry generates as much controversy as flammability. The last three years produced federal regulation of carpet flammability to protect consumers against gross hazard in carpeting and rugs. Yet, this regulation has not ended controversy since other standards are frequently imposed by specifiers.

Many institutional and public users, including government, frequently need more protection than is afforded by the Federal Consumer Standard. High population density, as occurs in theaters, and low occupant mobility, as occurs in medical facilities, are among the prime reasons for a higher standard. Accordingly, more stringent requirements are imposed by these users, including NAVFAC.

In applying flammability standards to Navy construction, NAVFAC has attempted to separate facility types with higher life safety hazard potential and require more stringent requirements only for these facilities. For others, where we are not faced with high hazard factors, the federal flammability standard is accepted. NAVFAC flammability requirements are as follows:

Medical/Dental Facilities; Sleeping Accommodations (including BEQ, BOQ, Family Housing and Navy Lodges); Theaters, Clubs, Schools and similar places of public assembly.

The carpeting system (carpeting *and* underlay together as they will be installed) must pass ASTM E-84, Steiner Tunnel test, with a flame spread rating of 75 or less. Alternatively, the carpeting system must pass UL 992, chamber test, with a flame propogation index of less than 4.0.

Other Occupancies — The carpeting must comply with Department of Commerce DOC FF1-70, Standard For the Surface Flammability of Carpets and Rugs. Carpeting meeting this standard may be used over any underlay.

What do these requirements mean in practical terms in specifying and purchasing carpeting? For the higher hazard facilities, somewhat less flexibility. Carpeting makers do not sell underlay, and therefore do not usually test combinations.

Few jobs are large enough for prospective sub-contractors to invest time and money in special testing of carpeting/underlay combinations, So, one is usually limited to available patterns and colors in foam-backed carpeting on which tunnel or chamber testing is regularly done by the manufacturer. Several of these materials are available on federal supply schedules. For other occupancies, the sky is the limit since all carpeting sold must meet the basic federal flammability standard.

Historical

Preserving the Navy's Heritage

By HOWARD C. MELTON
Facilities Planning Engineer
• Alexandria, Va.

Man from time immortal has exhibited a keen interest in his past history. Communities, areas, structures, sites and objects having historic, architectural, social or cultural significance provide tangible evidence of man's link with the past. Such attachments with the past are important for the spiritual and educational values inherent therein, as well as the qualtiy and meaning they add to American life. This curiosity and interest in our past heritage has fostered an intense desire to protect and enhance the truly historical and significant vestiges of our past. This interest in conservation is sagaciously stated by Sidney Hyman in the following quote:[1]

"What we want to conserve is the evidence of individual talent and tradition, of liberty and union among successive generations of Americans. We want the signs of where we came from and how we got to where we are, the thoughts we had along the way and what we did to express the thoughts in action. We want to know the trails that were walked, the battles that were fought, the tools that were made. We want to know the beautiful or useful things that were built and the originality that was shown, the adaptations that were made and the grace-notes to life that were sounded. We want to know the experiments in community living that were tried and the lessons that were taught by a brave failure as well as a brave success."

[1] Albert Rains, *With Heritage So Rich*, Random House, New York, 1966, page 1.

Since the founding of the United States Navy at the height of the American Revolution in 1775, the history of the navy and of the United States have been closely entwined. Historic naval leaders of the past have performed heroic deeds in support and defense of the Constitution of the United States. Their actions have provided a source of inspiration for those who followed. It is imperative therefore that the physical vestiges associated with historic naval personnel or events be preserved for posterity. In keeping with this objective, OPNAV and NAVFAC Instructions on the "Protection and Enhancement of the Cultural Environment" will be promulgated in the coming months. These instructions are an outgrowth of an Executive Order and DoD Instruction on the same subject. The purpose of these instructions will be to delineate navy plans, policies, and programs needed for the maintenance, repair, restoration and reconstruction of districts, sites, buildings, structures, and objects possessing significance in American archaeology, architecture, history and culture. The National Register of Historic Places, which is maintained by the Department of the Interior, provides a listing of historic places that are currently registered. A review of the latest edition of the National Register reveals 4,790 historic places throughout the United States of which only 11 are located on navy real property. It is believed that this is an inadequate representation of the truly historic places actually possessed by naval activities and accordingly, a concerted campaign will be initiated upon dissemination of the NAVFAC Instruction in order to expand the navy entries on the National Register. In the interim, it is recommended that all CEC officers begin to investigate potential historic places to determine if they are worthy of nomination for the National Register in accordance with the criteria and procedures of the forthcoming NAVFAC Instruction. Let's play our part in insuring that all potential naval historic places shall not be allowed to inadvertently perish, but shall purposely have everlasting life.

Advice of Counsel

Government Procurement Commission

Good laws lead to making of better ones; bad ones bring about worse. As soon as any man says of the affairs of the State, "What does it matter to me?" the State may be given up for lost. — Jean Jacques Rousseau.

• Alexandria, Va.

A commission on government procurement devoted to studying and making recommendations to promote economy, efficiency and effectiveness in federal procurment was proposed in 1966, was created by P.L. 91-129 approved 26 November 1969, and released its four volume report in March 1973. Its recommendations, and significant absences of recommendations, will be subjects for discussion over the next several years, so that its findings regarding architectural and engineering services and construction are important to persons working with these procurements.

General Recommendations

Officers concerned with public works cannot look solely at the recommendations for construction and architectural-engineering procurement (volume 3) but must look also at general considerations and recommendations with overall effect. The first is to establish an Office of Federal Procurement Policy in the Executive Branch to oversee development and application of procurement policy, and the second is to consolidate the two primary procurement statutes (the Armed Services Procurement Act and the Federal Property and Administrative Services Act). The office would publish procurement regulations after soliciting the viewpoints of interested parties.

Although these two recommendations may have long-term indirect effects, the third, to establish competitive negotiation as an alternative to formal advertising, and the fourth, to require solicitations and discussions for competitive negotiations upon the basis of published evaluation criteria, may impact directly. Construction procurement, till now almost exclusively accomplished within the United States by formal advertising, may turn more to competitive negotiation, perhaps like turnkey. The small purchase limitation would be raised from $2500 to $10,000, permitting use of less formal and costly procedures on more contracts. The commission also recommends reexamining the range of social and economic programs applied in the procurement process, raising to $10,000 the level for their application, and making their cost more visible.

With regard to legal and administrative remedies for claims and disputes, the commission made many recommendations: informal conferences on final decisions, setting up regional small claims boards for disputes of $25,000 or less, empowering agencies to settle and pay all disputes connected with contracts, giving contractors the option of going to courts directly, allowing courts to take additional evidence, and paying judgments from agency appropriations.

Construction and Architectural-Engineering Service

The commission found more for discussion than for recommendation with regard to construction and A-E services. A-E services account for only 3/10 of 1% of federal procurement; but are much more significant than the percentage indicates and recently were the subject of P.L. 92-582 (the Brooks Bill). The commission recommends that A-E services be obtained by competitive negotiation, taking into account competence, proposal concepts, and prices; but a dissent urges that selection continue to be made in accordance with F.L. 92-582 on the basis of technical competence. The commission also recommends that projects costing over $500,000 explicitly take into account total life-cycle costs, that A-E proposal costs be reimbursed for projects with unusual design and engineering problems, and that the 6% statutory limit on A-E fees be eliminated altogether or excluded for renovations, projects under $500,000, and unusually complex and technical projects.

For construction, and the labor laws affecting construction, the commission made no formal recommendations. It found that the construction industry was divided among many firms (129,000 general contractors plus 240,000 specialty, only 1,200 of the generals employing more than 100 persons) but that 3/5ths of the labor was unionized, principally through the AFL-CIO Building and Construction Trades Department. Federal construction procurement for FY 1972 was estimated to come to $5,428 million, 9% of total federal procurement. The commission discusses the 5 year cycle from conception to completion, which the Public Building Fund and concurrency of some steps should reduce; subcontractor bid shopping, which does not seem to harm the government and for which the complicating remedies afford no full solutions; the furnishing of information on subsurface conditions, environmental requirements, and cost estimates, and standard products satisfying specifications; truth in negotiations and warranties; the financing of bond premiums, mobilization, and progress payments; and administration at the site and of progress payments.

Labor conditions and labor standards requirements are recognized to have profound impact. The Davis-Bacon Act is discussed in terms of conflicts with the National Labor Relations Act, the threshhold for application (an increase from $2,000 to $10,000, $25,000, or $100,000), the division of responsibility for administration among contracting officers, the Department of Labor, and the Comptroller General; the uncertainties of coverage for "construction" and "site of the work"; the determinations of prevailing wages; and the submissions of payrolls. The commission also discusses the costs of the Miller Act and the application of the Contract Work Hours and Safety Standards Act to a 4-day 40-hour week.

The commission's report cannot have effect until the recommendations have been debated and put into law and regulations over several years. The ultimate impact may not be great, for the problems and forces proved intractable and the multitude of inputs from the study groups and the membership itself cancelled out many new departures.

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BU3 Tom White is congratulated by Capt. R. A. Bafus, commanding officer of Public Works Center, Yokosuka, upon his selection to attend the Naval Academy in Annapolis with the Class of '77.

ANNAPOLIS CLASS OF '77

• Yokosuka, Japan

BU3 Thomas C. White, a Seabee with the U. S. Navy Public Works Center, Yokosuka, has been selected to attend the Naval Academy at Annapolis with the class of 1977.

Petty Officer White graduated from high school at Marblehead, Mass. in June 1969, then attended college at Carnegie Mellon University and Boston College where he studied physics for 2½ years.

After enlisting in the U. S. Navy on 15 February 1972, he earned the title of Company Honorman through his exceptional performance and positive attitude demonstrated at recruit camp, and went on to attain the highest average scores at his basic training in Orlando, Florida. He continued to distinguish himself at NAVSCON, Port Hueneme by graduating from the builder class with final marks of 96.54, placing him third in a class of 28.

BU3 White reported to U. S. Navy Public Works Center, Yokosuka on 27 August 1972, where he soon demonstrated his competence and motivation for donning gold bars. On 27 April 1973 he was officially notified of his appointment to the U. S. Naval Academy, to be sworn in on 9 July 1973.

Despite his intent to become an officer in the United States Navy, BU3 White continues to demonstrate the indomitable "Can Do" spirit of the Seabees by stating his intent to graduate number one in the Naval Academy class of 1977.

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